

PREFACE

THE object of this text-book is to provide a survey of the world such as must form the main body of a Secondary School course in geography, and such as is needed for the 'General World Geography' of the various School Certificate Examinations.

The volume is intended to supplement, not replace, other books of the series which are written for specific grades of pupils, and for more detailed studies of the continents. At the same time the author has had in mind the needs of those teachers who wish their pupils to study the same book for three or four successive years, as well as of those who desire a more concise course of regional geography. Attempt has been made, therefore, to maintain throughout a simple and direct style, so as to make the book suitable for a fairly wide range of ages and capabilities.

The first part of the book deals with the world as a globe and with the major natural regions. In the author's experience pupils frequently find these fundamental topics uninteresting, and consequently difficult. It has, therefore, been considered desirable to sacrifice to some extent the purely academic method of presentation in order to arouse and sustain the interest of the pupils. Thus, some illustrative details from common experience, such as the practical teacher constantly uses in lessons, have been used to introduce and explain some of the more difficult topics. In the study of natural regions the pupils are not presented at the outset with a complete and highly confusing map, but each region is introduced by a special map, while subsequent maps revise and extend the knowledge thus gained. A similar principle has been adopted with regard to the chief agricultural products

of the world; in the study of each natural region a few typical products have been dealt with, thus obviating the necessity for a lengthy, and therefore wearying, series of lessons on world distributions.

In brief, the object aimed at has been the easing of the burden for the pupil rather than the neat division of the subject into compartments.

The second part of the book provides a rapid survey of the outstanding features of the geography of the continents. Here, apart from placing last the most complex continent—Europe—there has been no attempt at grading according to difficulty. The teacher may therefore alter the sequence to suit the school course, without imposing difficulties on the pupils.

The author wishes to record his sincere thanks to a former pupil, H. Chambers, Esq., B.A., who has given valuable assistance in reading the proofs. Thanks are also due to the following for permission to use material:

The Air Ministry for Figs. 22, 23, and 24; Messrs. Oliver and Boyd for Fig. 45; the editor of the *Manchester Guardian Commercial Supplement* for Fig. 184; and the editor of *The Economist* for Fig. 193.

T. PICKLES.

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SECTION I

GENERAL WORLD GEOGRAPHY

CHAPTER I

THE EARTH AND THE SUN

'No!' said the old lady, 'I do not like bright winter days. See how the sun shows up the dust under the dresser! In summer it does not matter because the sun is higher in the

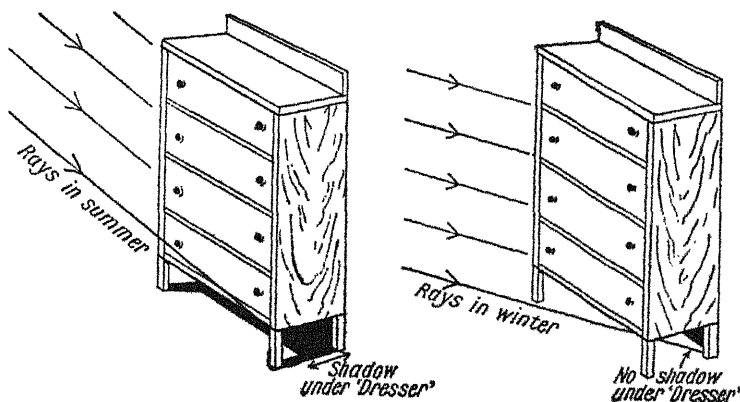


FIG. I. SHADOWS IN SUMMER AND WINTER

sky, and it doesn't reach as far under' (see Fig. 1). The old lady had hardly ever been to school, but her observations had led her to a realization of one of the most important facts in geography, viz. that the inclination of the sun's rays varies throughout the year. Had she been able to travel to other

THE EARTH AND THE SUN

countries she would no doubt have also realized that the inclination of the sun's rays varies from place to place. It is

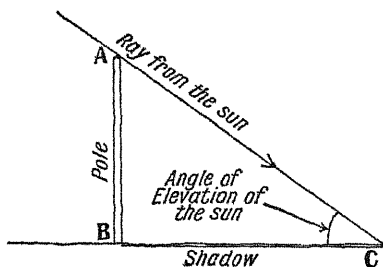


FIG. 2. ELEVATION OF THE SUN

easy to check the observations of the old lady by taking definite measurements several times a year as follows: Choose a pole which casts a shadow on level ground. Measure the length of the pole (AB) at noon on a particular day and the length of the shadow (BC) (see Fig. 2).

Draw the pole and the shadow to scale, then the angle ACB gives the elevation of the sun.

WHY IS IT WARMER IN SUMMER THAN IN WINTER?

In the northern hemisphere the midday sun has its lowest elevation about 22nd December (the shortest day) and its

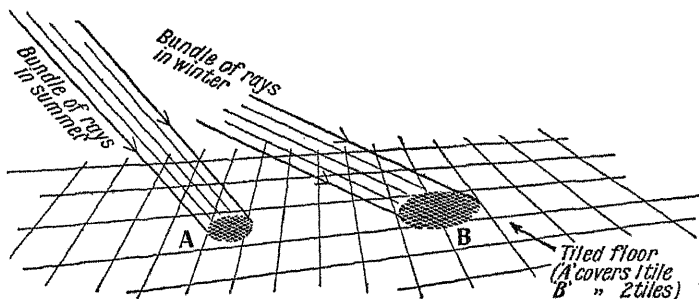


FIG. 3. SUN'S RAYS IN SUMMER AND WINTER

greatest elevation about 21st June (the longest day). As shown in Fig. 3, at A and B, the sun has more heating power

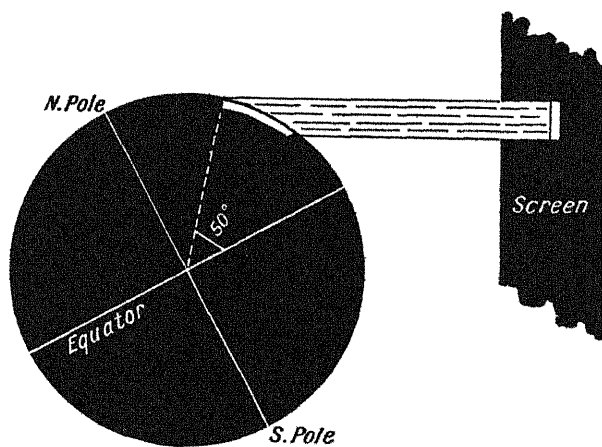
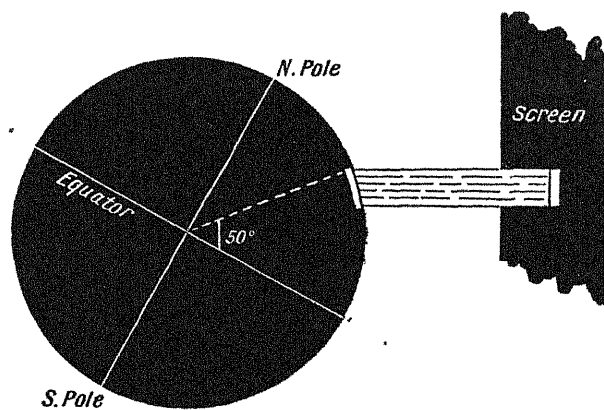


FIG. 4. SUN'S RAYS IN THE NORTHERN SUMMER (*above*) AND THE NORTHERN WINTER (*below*)

when it is high in the sky than when it is low. In each case the sunbeam is of the same width, but in winter it spreads over nearly twice as much floor space as in summer; consequently, it heats the earth more in summer than in winter. (See also Fig. 4.)

Another reason why summer is warmer than winter is that in our latitude the length of daylight is about seventeen hours in summer, whereas in winter it is only about seven hours. The sun may be thought of as a workman who works hard for seventeen hours in summer and not so hard for only seven hours in winter.

SIZE, SHAPE, AND MOVEMENTS OF THE EARTH

Practically everybody nowadays agrees that the earth is roughly spherical, but it is interesting to think out some of the facts which confirm this belief. Airmen have flown round the earth and 'over the top' of it; men have sailed round the earth and even walked nearly all round it in various directions; wireless waves go round it, and earthquake waves go round it and through it; no matter how high the airman gets above the earth the horizon is always a circle; and measurements of the curvature of the earth's surface, which have been made with great accuracy in many districts, have failed to find any part of the surface which is not almost exactly part of a sphere.

The earth is, however, not quite spherical, as its equatorial diameter is 7,926 miles, while its Polar diameter is 7,900 miles. (On this scale a three-inch sphere would be only one-hundredth of an inch out of shape.) The mountain peaks and ocean depths are only minute irregularities on the surface of a sphere; indeed, if the earth were reduced to the size of an orange, it would be as smooth as any orange.

The circumference of the earth at the Equator is 24,900

miles; in latitude 30° the distance round the earth, parallel to the Equator, is 21,400 miles; but at latitude 60° it is only 12,500 miles.

THE MAP 'NET': LINES OF LATITUDE AND LONGITUDE

The lines of latitude and longitude, which make the map 'net,' serve the same purpose as the squares referred to by wireless commentators when describing a football match—they enable us to fix the position of any point. The lines of latitude are circles parallel to the Equator; they are, therefore, often called *parallels*. The lines of longitude are circles passing through the Poles; a half-circle from Pole to Pole is called a *meridian*.

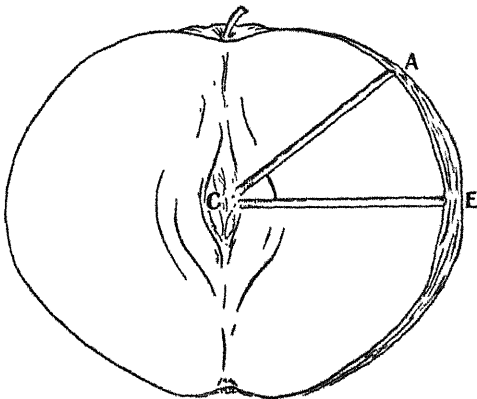


FIG. 5. WORM-HOLES, ILLUSTRATING LATITUDE

When we say that a place is in latitude 50° N. we mean that it is 50° north of the Equator. But degrees measure angles, not distances; can you, for example, stand at a distance of 50° from your desk? How then can a place be 50° from the Equator? Imagine the earth to be an apple (see Fig. 5); a worm bores to the centre from E (the Equator) and another bores to the centre from A; then the angle between the two worm-holes gives the latitude of A. Thus we see that latitude is the *angular* distance from the Equator.

Of course, to determine the latitude of a place, it is not necessary to bore tunnels to the centre of the earth! Actually all that is necessary is to get the elevation of the midday sun on 21st March or 22nd September, then as shown in Fig. 9 the latitude will be obtained by subtracting the elevation

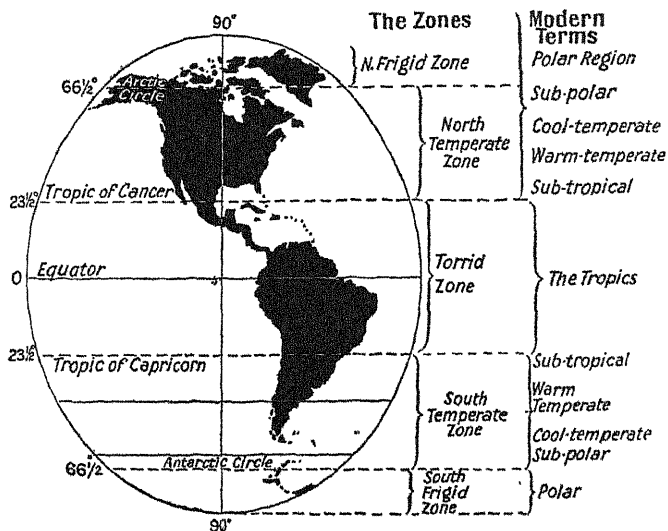


FIG. 6. ZONAL DIVISIONS

from 90°. The latitude may be found on other days in the year by doing the same experiment and adding or subtracting a number which can be obtained from tables in Whitaker's *Almanack* and other publications.

THE ZONES OF THE EARTH

The Tropics of Cancer and Capricorn, each $23\frac{1}{2}^{\circ}$ from the Equator, mark the northward and southward limits of the vertical sun. The Arctic and Antarctic Circles, each $66\frac{1}{2}^{\circ}$

from the Pole (i.e. lat. $66\frac{1}{2}^{\circ}$), mark the southward and northward limits of the midnight sun. It was formerly customary to use these lines to divide the earth into zones as shown in Fig. 6. These zonal names are, however, little used at present, though the following divisions of the so-called Temperate Zone are often used: Sub-polar ($66\frac{1}{2}$ – 60°), Cool-temperate (roughly 60 – 40°), Warm-temperate (roughly 40 – 30°), and Sub-tropical (roughly 30 – $23\frac{1}{2}^{\circ}$).

THE SEASONS

The earth *rotates* on its axis once every 24 hours, the part which is turned towards the sun having daylight while the part away from the sun is in darkness. The sun rises in the eastern part of the sky, and sets in the western part, so that it appears to travel across the sky from east to west. We know, however, that it is the *earth* which is moving relative to the sun, so we deduce that the direction of rotation of the earth is from west to east.

The earth also moves around the sun, or *revolves*, on a path which is known as the *orbit*. As shown in Fig. 7 the earth's orbit is not circular, but elliptical, with the sun placed at one of the foci of the ellipse.

The axis of the earth is not 'upright' (i.e. at right angles to the plane of the orbit) but is tilted at $23\frac{1}{2}^{\circ}$ from the vertical. (We know already that $23\frac{1}{2}^{\circ}$ N. and $23\frac{1}{2}^{\circ}$ S. are called the Tropics of Cancer and Capricorn respectively, while $66\frac{1}{2}^{\circ}$ N.—i.e. 90° minus $23\frac{1}{2}^{\circ}$ —is the Arctic Circle. While reading through the next few pages, try to find out why $23\frac{1}{2}^{\circ}$ has been selected for marking out the 'zones'.)

The tilt of the earth's axis accounts for the fact that the number of hours of daylight per day varies in different parts of the earth; and the tilt, combined with the revolution of the

earth around the sun, accounts for the four seasons—spring, summer, autumn, and winter. In the northern hemisphere spring lasts from 21st March to 21st June, summer from 21st June to 22nd September, autumn from 22nd September to 22nd December, and winter from 22nd December to 21st March. Though the 21st of June is the *first* day of summer the 24th of June is called Midsummer Day. Why is this?

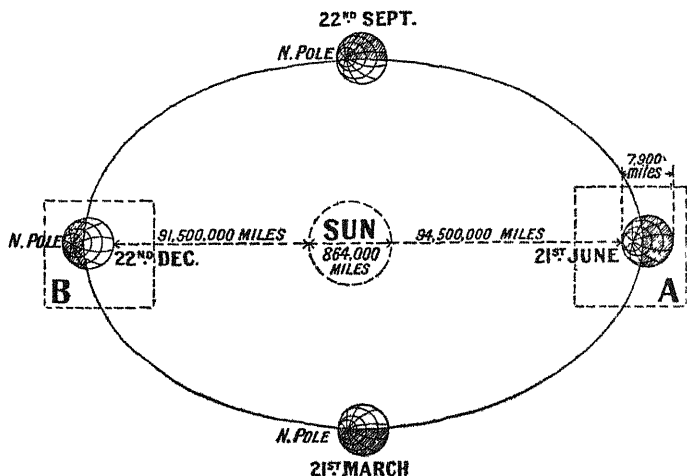


FIG. 7. POSITIONS OF THE EARTH IN RELATION TO THE SUN

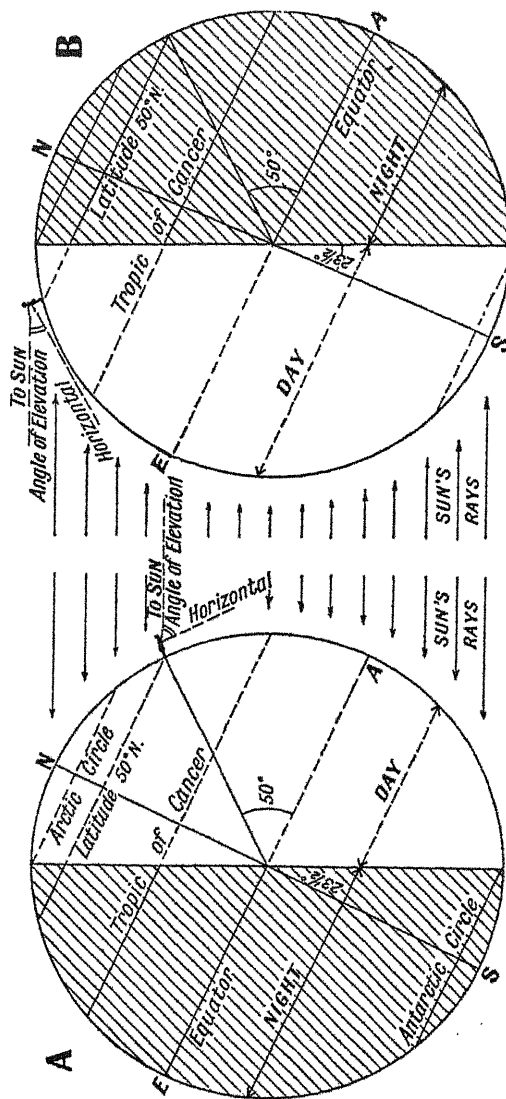
In the northern summer the earth is in the position shown at A in Fig. 7, and in the northern winter as shown at B. (Note that the distance from the earth to the sun is 91 million miles in our winter and 94 million miles in our summer; hence it cannot be the distance of the earth from the sun which causes the difference between summer and winter.)

Conditions in the northern summer are shown in Fig. 8A, which is an enlargement of portion A in Fig. 7. The little man is standing vertically since a line through his body would,

* B

JUNE 21ST
NORTHERN SUMMER

DEC. 22ND
NORTHERN WINTER



SOUTHERN WINTER

SOUTHERN SUMMER

FIG. 8. THE ATTITUDE OF THE EARTH TO THE SUN—SUMMER AND WINTER

if continued, go to the centre of the earth; one arm is held horizontally, the other points to the sun, and the angle between them is the angle of elevation—in this case $63\frac{1}{2}^{\circ}$.

Conditions in the northern winter are shown in Fig. 8B, which is an enlargement of portion B, of Fig. 7. Again one arm is raised horizontally and one arm points to the sun, the angle between them being the angle of elevation. Note the following points:

1. The line EA which represents the Equator is equally divided in both December and June showing that at both dates the length of day is twelve hours. (Indeed the length of day at the Equator is always about twelve hours, the sun rising about 6 a.m. and setting about 6 p.m.)

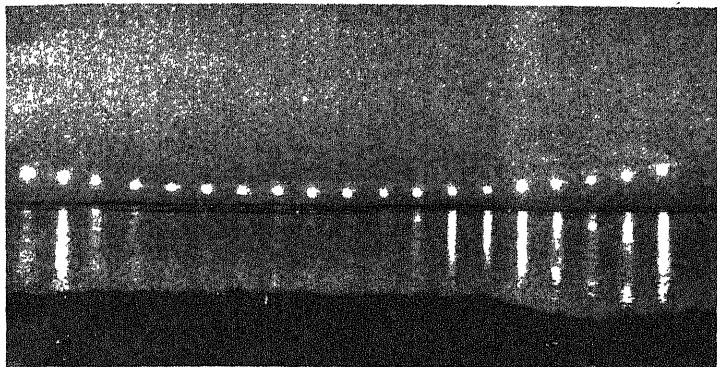
2. When it is summer in the northern hemisphere it is winter in the southern hemisphere.

3. In summer the days are longer than the nights.

4. In winter the nights are longer than the days.

5. Between the Arctic Circle and the North Pole the sun shines for twenty-four hours on 21st June and does not shine at all on 22nd December.

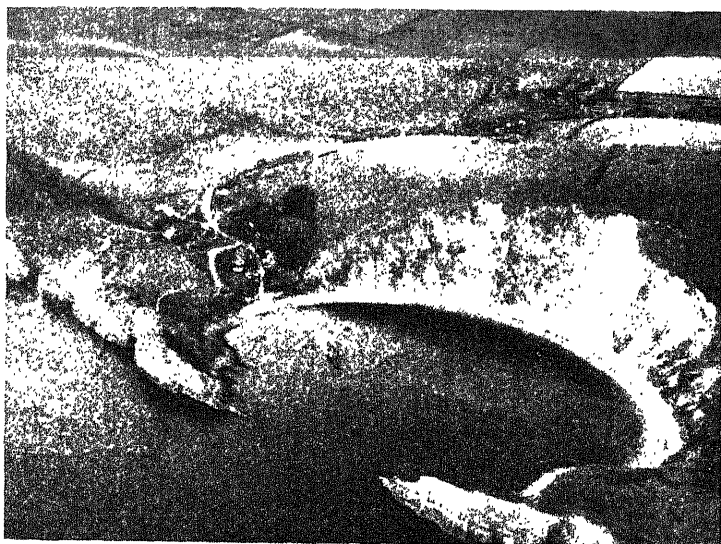
6. Between the Antarctic Circle and the South Pole the sun does not shine at all on 21st June, but shines all day on 22nd December. (At the North Pole the sun never sets for six months and never rises for the other six months. At the Arctic Circle there is one day in the year—21st June—when the sun never sets, and one day—22nd December—when it never rises. Midway between the Arctic Circle and the North Pole, we have three months' darkness and three months' daylight. The South Pole has six months' darkness from April to October and six months' daylight from October to March, and the Antarctic Circle has one day of midnight sun on 22nd December.)



Charles Renach, by courtesy of 'The Beaver'

SUCCESSIVE POSITIONS OF THE 'MIDNIGHT' SUN IN NORTHERN CANADA

Nineteen separate photos taken on the same plate, at ten-minute intervals, the camera remaining stationary



LULWORTH COVE

Acrofilms Ltd.

THE ATTITUDE OF THE EARTH TO THE SUN AT THE EQUINOXES

On 21st March and 22nd September the midday sun is vertically overhead at the Equator, the sun rises and sets at approximately 6 o'clock over all the earth, and days and nights are everywhere equal. On these dates the earth is midway between the 'summer' and 'winter' positions (see

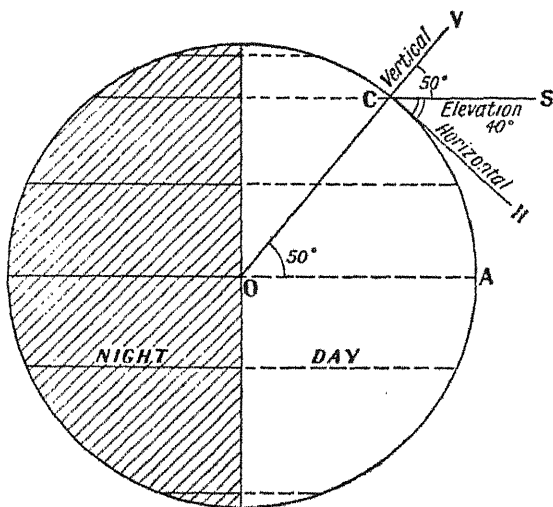


FIG. 9. THE ATTITUDE OF THE EARTH TO THE SUN AT THE EQUINOXES

Fig. 7), and the sun's rays just reach both North and South Poles. Fig. 9 shows, diagrammatically, the attitude of the earth to the sun at the Equinoxes. It should be noted that the axis of the earth is not vertical; it is foreshortened, one end pointing towards the reader and the other from him.

It will be noted in Fig. 9 that:

1. As the angle COA is 50° , the latitude of C is 50° .
2. The elevation of the sun is the angle SCH which is equal to $90^\circ - \text{angle VCS}$.

THE EARTH AND THE SUN

But angle VCS = angle VOA = latitude of C,

i.e. angle SCH = 90° — latitude of C.

i.e. *At the Equinoxes, Elevation* = 90° — *latitude*.

On 21st June the earth's axis is tilted with the North Pole $23\frac{1}{2}^\circ$ further towards the sun; hence on this date in the northern hemisphere

$$\text{Elevation} = 90^\circ - \text{Latitude} + 23\frac{1}{2}^\circ.$$

On 22nd December the earth's axis is tilted with the North Pole $23\frac{1}{2}^\circ$ further from the sun; hence on this date, in the northern hemisphere,

$$\text{Elevation} = 90^\circ - \text{Latitude} - 23\frac{1}{2}^\circ.$$

THE MOVEMENT OF THE VERTICAL SUN

As the earth revolves on its orbit during the course of the year the vertical sun swings north and south of the Equator. On 21st March it is over the Equator; on 21st June it has reached its furthest point north—the Tropic of Cancer (lat. $23\frac{1}{2}^\circ$ N.); on 22nd September it is back again at the Equator; and on 22nd December it has reached its furthest point south—the Tropic of Capricorn ($23\frac{1}{2}^\circ$ S.).

MEASUREMENT ON THE GLOBE

Lines of latitude on the globe are circles parallel to the Equator, and the distance from one line of latitude to the next is constant. As the circumference of the earth is 25,000 miles, one degree of latitude equals $25,000 \div 360$, i.e. roughly $69\frac{1}{2}$ miles.

It is, therefore, possible to find the scale of a map by measuring the distance between the lines of latitude. In Fig. 10, for example, the perpendicular distance between 10° N. and 15° N. (i.e. 5° of latitude) is one inch.

But 5° of latitude = $5 \times 69\frac{1}{2}$ miles = $347\frac{1}{2}$ miles.

Therefore the scale of the map is $347\frac{1}{2}$ miles to 1 inch.

Lines of longitude, or meridians, are circles which pass through each Pole. The distance between two successive meridians is greatest at the Equator, and diminishes towards the Pole. At the Equator, one degree of longitude equals $69\frac{1}{2}$ miles, but elsewhere longitude cannot be conveniently used as a basis for the determination of the scale of the map.

GREAT CIRCLES

Yokohama and San Francisco are in approximately the same latitude, so it might be thought that the shortest distance between them was the 'straight line' parallel to the Equator. The steamship route, however, is a curve to the north of this line (see Fig. 11), and this is actually the shortest distance, as

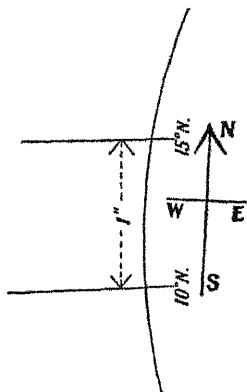


FIG. 10.
LATITUDE AND SCALE

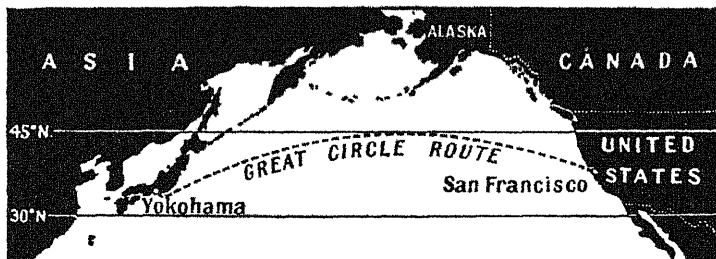


FIG. 11. A GREAT CIRCLE ROUTE

can be shown by stretching a piece of string between the two points on the globe. It will be found to take up the position shown in Fig. 11, whereas a greater length of string will be

needed to go along the line of latitude between the two places.

If the line giving the shortest distance between the two points be continued it will form a circle whose centre is the centre of the earth. Any such circle (including the meridians and the Equator) is called a great circle.

The shortest distance between two points on the globe is the arc of the great circle passing through those points.

Other striking examples of great circle steamship routes are those from Cape-town to Adelaide and from Panama to Liverpool; the proposed air service over the North Pole from Siberia to the United States also follows a great circle route.

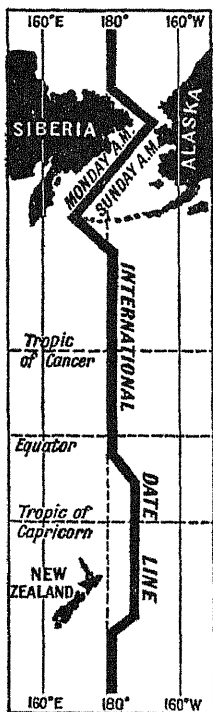


FIG. 12.

THE DATE LINE

LONGITUDE AND TIME

Suppose we have an aeroplane capable of flying at over 600 miles per hour, for 24 hours. We start at sunrise on, say, Monday, 10th May (any other day will do as well), and fly westward at 625 miles per hour. This is just the speed at which the earth is rotating in this latitude, so if we look back after an hour's flying, we shall still see the sun just rising—it is still sunrise, on Monday, 10th May, and when we have flown 10 hours, 15 hours, 20 hours, it is still just sunrise. In exactly 24 hours we shall be back in England, and it will still be sunrise, as it has been all the way round the earth. So, apparently, we shall have flown round the earth in no time—and if we

had only put on a little extra spurt we could have done it in less than no time! Of course, we have actually taken 24 hours, and we find that it is now sunrise on *Tuesday*, 11th May. But it has been sunrise on Monday, 10th May, to us all the way round the earth. Somewhere we must have passed from Monday into Tuesday! Where does Monday end and Tuesday begin? The answer is, at the International Date Line, which in the main follows longitude 180° . It would, of course, be very inconvenient if the Date Line crossed inhabited land, so that, for example, it was Monday in school, while it was still Sunday on the other side of the street. Fortunately 180° longitude passes over very little land, and where it does pass through a group of islands, the Date Line is bent round them (see Fig. 12).

Incidentally we may note that on the Date Line it is literally possible to 'knock a man into next week!'

Sun Time. It is noon at any place when the sun is at its highest point in the sky. As the sun apparently moves round the earth from east to west, noon comes earlier in the east than in the west. When it is midday at longitude 180° it is midnight at longitude 0° , exactly half-way round the earth; when it is midday at 90° E. it is 6 a.m. at Greenwich (0°); the difference of time for 60° of longitude (one-sixth of the way round the world) is 4 hours (one-sixth of 24 hours). We may get simple formulae for these time differences as follows:

$$\begin{array}{l|l} 360^\circ = 24 \text{ hrs.} & 24 \text{ hrs} = 360^\circ. \\ 1^\circ = \frac{24 \times 60}{360} \text{ mins.} & \text{i.e. } 1 \text{ hr} = 15^\circ, \\ \text{i.e. } 1^\circ = 4 \text{ mins.} & \end{array}$$

EXERCISES

- Find the local time at (a) 90° E., (b) 90° W., (c) 60° E., (d) 134° W. (When it is noon at Greenwich.)
- Find the time in England when it is noon at (a) 80° E., (b) 175° W., (c) 64° E.

Time Zones

It is noon by Greenwich time when the sun has reached its highest point in the sky at Greenwich; but at Plymouth (4° W.) the sun will be at its highest point 16 minutes later than at Greenwich. This difference between local time and Greenwich time is so small that over the whole of the British Isles we go by Greenwich time. But consider a big country like Canada. When it is noon in Halifax on the west coast

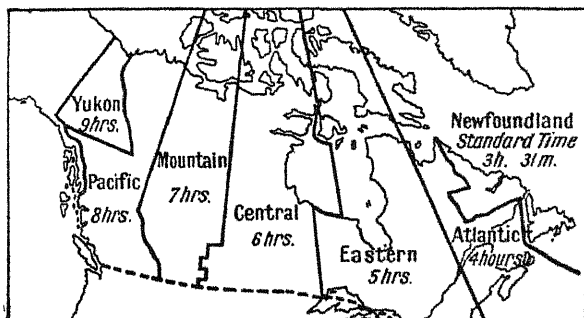


FIG. 13. TIME ZONES OF CANADA

Showing number of hours behind Greenwich time.

(64° W.) it is, by sun time, only 8 a.m. at Vancouver (123° W.). It would obviously be most inconvenient to have the same standard time and working hours over the whole of Canada, as that would mean, for example, that the people of Vancouver would not have breakfast-time until noon, and it would nearly always be dark before the working day was over. Consequently, North America has been divided into time zones as shown in Fig. 13. On a journey across Canada by rail from east to west passengers have to set back their watches by one hour each time they pass into a new time zone. Similar time zones have been adopted in other continents.

CHAPTER II

WEATHER AND CLIMATE

EVERYBODY is interested in the weather, or so one would judge from its frequency as a topic of conversation—but whoever talks of climate out of school? Yet, what is the difference between weather and climate? Both are concerned with wind, rain, heat, cold, etc. Yet we cannot say: 'What a wet climate we are having to-day!' The reason is, of course, that climate is the *average* weather experienced at a given place over a long period.

The British Meteorological Office makes weather maps showing the conditions at various times each day, but our atlases show *climatic* maps for a whole year or for half a year or for a particular month. Suppose you wish to know about conditions in a distant country, which would be more useful, weather maps or climatic maps? Of course, the best thing would be to have a weather map for each day for many years, but we should soon get tired of looking over the weather maps and ask for a summary of them. Such a summary based on the average weather would be a *climatic* map.

Think of the labour required to make a rainfall map. The first necessity is to obtain the average annual rainfall of hundreds of places within the area to be mapped.

The instrument used to measure rainfall is a rain gauge (Fig. 14). It consists of the following parts: a funnel with a sharp edge so as to cut the drops of rain, a metal receiving jar, and a metal case containing both receiver and funnel. The rain that is collected in the receiver is poured into the narrow

measuring jar so graduated that one-tenth of an inch is represented by about half an inch. The reason for this is, of course, that although the rain falls over the area of the wide funnel it is being measured in a narrow jar; consequently one-tenth of an inch in the funnel would make about half an inch in the measuring jar. The rainfall must be read each day and the total obtained for the month and the year. This must be done every day for about thirty years in order to get a fair

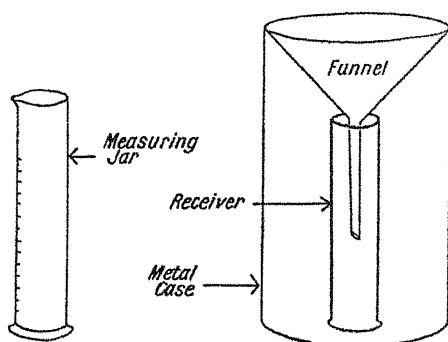


FIG. 14. RAIN GAUGE

average. When this has been done for hundreds of places the average rainfall may be plotted on a map and places with the same average joined by a line. Thus we should get a rainfall map similar to those in our atlases. Surely such maps are at least worthy of respect if only because of the great amount of labour entailed in their production?

Temperature maps, too, are the result of a great deal of careful observation. In order to get an accurate average of the temperature over twenty-four hours it would be necessary to read the thermometer every half-hour. This, of course, would be more than one person could keep up for above a day or two. Fortunately it has been found in practice that a

maximum-and-minimum thermometer will enable us to get an average by taking only one reading each day. In this thermometer a pointer is left at what has been the highest temperature since the thermometer was last set, and another pointer is left at what has been the lowest temperature. The average is obtained by adding the maximum and the minimum and dividing by two.

Isotherms are lines joining places of the same temperature. They may be made intensely interesting, especially when they are regarded as strings on which to hang pictures. Here are a few such pictures:

1. Look at the isotherm map of north-eastern Asia for January and find the line marked -75° F. Here is situated Verkoyhansk, the coldest place in the world. Sir H. de Windt recorded the following experiences in this region: 'Milk frozen and cut into cubes was carried in a net attached to the sleigh. . . . My companion removing his mitts to take a photograph accidentally touched some metal on the camera, and his fingers were seared as with red-hot iron. . . . The cold was so intense that the breath froze as it left our lips and fell in a white powder to the ground. . . .'

2. In north-western India the July isotherm map shows an area with an average temperature of over 96° F. White people living there dare hardly leave the house after 7 a.m.; and even in spite of the constant cooling of the air by the sprinkling of water on grass screens over the doorways, the temperature inside the house may be over 110° F.; after a few weeks of this the European becomes so limp and weak that he can neither eat, work, nor sleep.

3. North China is crossed by the 10° F. isotherm in January and the 80° F. isotherm in July. A Chinaman in this region has his winter clothes made on the principle of an eiderdown, —two pieces of cotton with cotton-wool or down stuffed

between them. In summer, however, his dress consists of cotton shorts and singlet, with a large sun-hat. Try, in imagination, to hang these summer and winter clothes on the isotherms; if you do this the isotherms will cease to be merely lines on the map and become interesting summaries of the geography of various regions.

LAND VERSUS SEA

It is a matter of common observation that land heats more quickly than water in summer and cools more quickly in winter. You have, for example, on a summer holiday basked in the warm sun and then gone for a dip in the cool sea; both land and sea have been exposed to the same heat, but the sand has become warmer than the sea. In winter, during a slight frost, mud round a pond freezes before there is any covering of ice on the water, showing that the land has cooled more quickly than the water. This difference between land and sea is clearly shown on the isotherm maps. In January, for example, the middle of Canada has a temperature of 0° F., but the west coast in the same latitude has a temperature of 40° F. and the east coast 20° F. In July, on the other hand, the middle of Canada is over 64° F., while the coasts are only about 60° F.

The difference between the summer and winter temperatures of a place is called the *range of temperature*. Places with a high range of temperature (say over 40°) are said to have an *extreme* climate. Places with a low range of temperature (less than 30°) are said to have an *equable* climate. Thus, the interior of Canada with a range of 65° has an extreme climate, while the west coast with a range of only 25° has an equable climate.

The most extreme temperatures are found in the interiors

of large continents and near the Arctic Circle. Even islands in polar seas have a great range of temperature since the sun shines continually for several months in summer and does not rise for several months in winter. In the northern part of the continental interiors there is a similar, though smaller, difference between the duration of daylight of summer and winter, and to this has to be added the rapid cooling of the

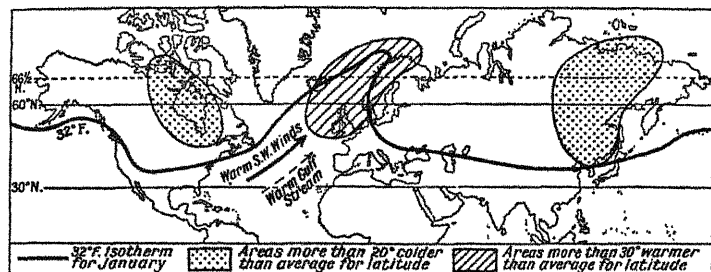


FIG. 15. WINTER TEMPERATURES, NORTHERN HEMISPHERE

land in winter and its heating in summer. Consequently it is in such regions that the most extreme climates are found.

In temperate latitudes east coasts are more extreme than west coasts, the principal reason being that the west coasts receive winds from the sea, which is relatively warm in winter and cool in summer, while the east coasts receive winds from the interior, which is hot in summer and cold in winter.

As shown in Fig. 15 the British Isles have remarkably warm winters for their latitude. The 32° F. isotherm, which swings down to latitude 38° N. in America and latitude 33° N. in Asia, reaches far beyond the Arctic Circle off the coast of Norway. The 'gulf of ocean warmth' in which the British Isles are situated is due, primarily, to the warm westerly winds, but the Gulf Stream is also of some importance in keeping our islands warm in winter.

The most equable climates are found near the Equator, since there the length of day is always about twelve hours, and there is little variation in the elevation of the sun. Islands on the Equator and in the middle of the ocean have an almost absolutely equable climate. The great writer, Robert Louis

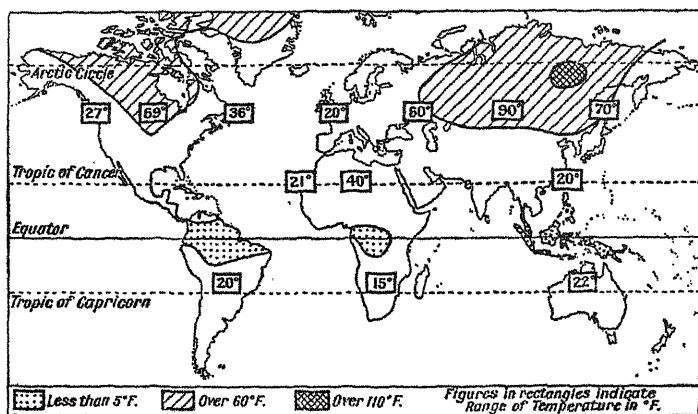


FIG. 16. RANGE OF TEMPERATURE

Stevenson, suffered from a disease which made it necessary for him to avoid any variation in the weather. Consequently, he went to live on one of the Samoan Islands, near the Equator, in the middle of the Pacific Ocean, where the range of temperature is practically zero.

THE HEAT EQUATOR

The Heat Equator is the line joining the points of highest temperature at any particular time. If the globe were all water the Heat Equator would be a straight line parallel to the Equator. In March and September, when the midday sun is vertically overhead, the Heat Equator and the real Equator

would coincide. In July, when the vertical sun is near the Tropic of Cancer, the Heat Equator would be some distance north of the Equator, while in January, when the sun is

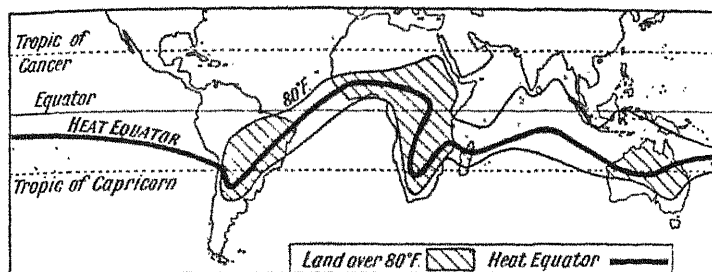


FIG. 17. THE HEAT EQUATOR IN JANUARY

vertical near the Tropic of Capricorn, the Heat Equator would have moved to a position south of the real Equator.

Figs. 17 and 18 show that the Heat Equator is very far

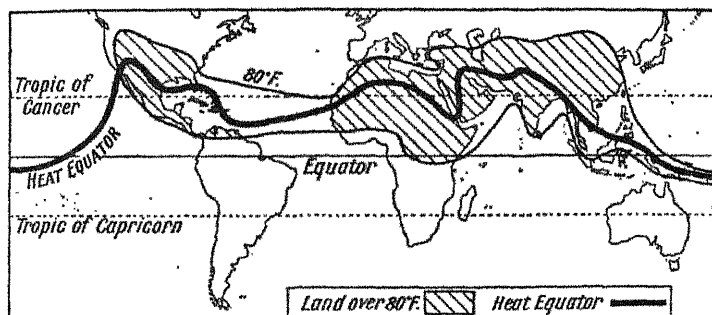


FIG. 18. THE HEAT EQUATOR IN JULY

from being a straight line. In July it has great northward bulges over South America, Africa, and Asia, due to the fact that the land heats more quickly than the sea. In January the Heat Equator is mainly south of the real Equator, and

there are great bulges to the south over South America and Africa, due again to the fact that in summer the land heats up more quickly than the sea. It will, however, be noticed that in Africa the Heat Equator remains north of the real Equator, even in January, showing that the land near the Equator retains much of its heat even in 'winter.'

RAINFALL

Here are three mental 'snapshots' which illustrate certain important facts about air and moisture:

1. Damp clothes hanging round the kitchen fire on a wet washing day.

2. The Indian colonel, who, finding moisture trickling down the outside of his glass of whisky and water, declares that his glass is leaking in a strange way—letting the water out, but keeping the whisky in!

3. A boy taking the valve out of a bicycle tyre and noticing that the stream of air feels very cold.

The first 'picture' emphasizes the fact that warm air holds more moisture than cold air—it is, of course, the warm air, not the fire, which takes the moisture out of the clothes. The story of the colonel reminds us that when warm, moist air is cooled (in this case by contact with the cold glass) some of the water vapour in it is condensed. The coolness of the air escaping from the tyre is an illustration of the fact that when air expands it cools.

When a body of air rises it cools, partly because it comes into contact with cool layers of air, and partly because the reduction of pressure causes it to expand.

Warm moist air may be forced to rise in the following ways:

1. By being compelled to rise over high land. The rain which

is caused in this way is known as *relief rain*. When the air has passed over the crest of the mountains and descends down the other side, it is getting compressed and becoming warmer,

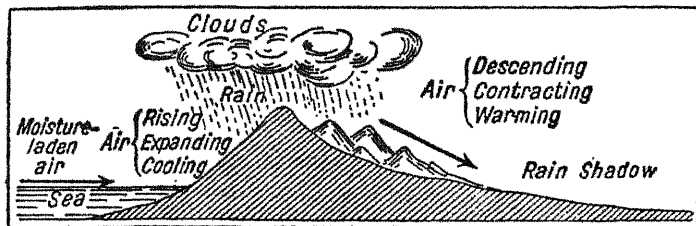


FIG. 19. RAIN SHADOW

hence it drops little rain. The land in the lee of the mountain range is said to be in the rain shadow (see Fig. 19).

2. By being driven over a body of cold air or thrust up by a wedge of cold air passing underneath it. This often

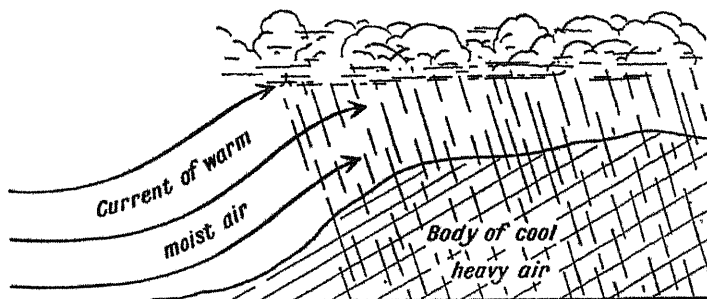


FIG. 20. FORMATION OF RAIN IN A 'DEPRESSION'

happens in the depressions or cyclones which, as explained later, cause so much of the rain in temperate regions (see Figs. 19 and 20).

3. By the over-heating of a portion of the earth's surface. This causes the air over the heated portion to rise while

cooler air is drawn in to take its place. Such currents, which rise up the centre and are drawn in at the sides, are known as convection currents and rain formed in this way is known as *convection rain*.

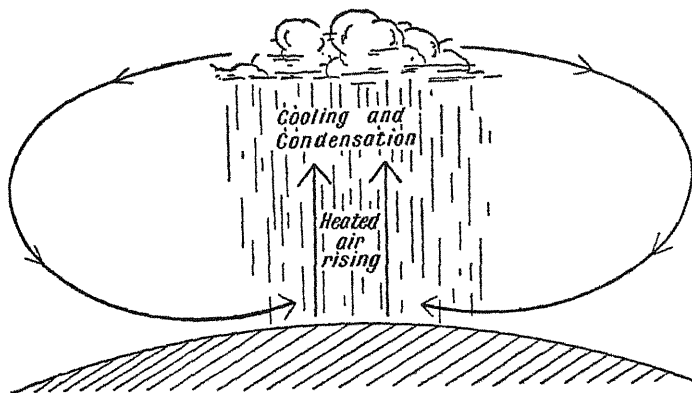


FIG. 21. CONVECTION CURRENTS AND RAIN

WINDS

Mankind was for ages puzzled about the wind. He knew there was such a thing because he could hear it, feel it, and see its effect, but he did not know how it was caused or 'whence it cometh or whither it goeth.' Yet the explanation is simple; just as water flows from high land to low land, so the wind blows from high pressure to low pressure.

The instrument used for measuring the pressure of the atmosphere is a barometer. This may easily be made by taking a tube about three feet long and filling it with mercury, then placing a finger on the open end and inverting the tube into a dish of mercury. The mercury in the tube falls until there is a column of mercury about thirty inches high, the

remainder of the tube being empty of air. The reason the mercury does not fall out of the tube is that the air, pressing down on the dish of mercury, holds up the column. The pressure of the air is spoken of as being so many inches: this means that the pressure is sufficient to hold up the column of mercury measuring that number of inches.

In Britain the pressure varies from 28 inches to 32 inches, below 29 inches being considered low pressure and over 30 inches high pressure.

If the earth were still, the wind would blow directly from high pressure to low pressure, but as the earth is rotating the wind is deflected. To see the effects of the rotation of the earth take a black-surface globe and set it spinning from west to east to represent the rotating earth. Now draw a piece of chalk down the northern hemisphere. When the globe is stopped the line will be found to run not from north to south but from north-east to south-west. In the same way a wind which would blow from the north on a stationary globe is deflected by the rotation of the earth so that it becomes a north-east wind. In the southern hemisphere a north wind would become a north-west wind.

DEPRESSIONS

A 'depression,' such as we so often see mentioned in our official weather forecasts, is an area of low pressure, surrounded by areas of higher pressure. In a depression the winds tend to blow round the centre in an anticlockwise direction, and in parts of the depression warm, moist air is forced upwards by cold, heavy air from the Pole, thus causing heavy rain. In the north Atlantic depressions are very frequent, and they usually pass over our islands from west to east, giving us our typical unsettled weather—a short period of

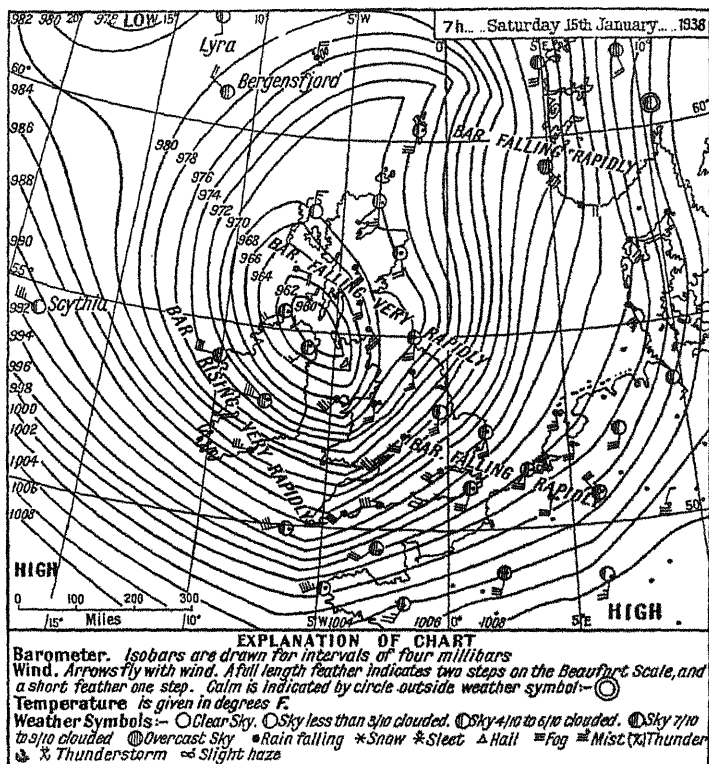


FIG. 22. A TYPICAL DEPRESSION

Map based on the daily weather report, by permission of the Air Ministry.

fine weather, followed by a day or two of mild wet weather while the depression is over our islands, and by clearing showers as the depression passes away.

It is, indeed, to depressions, rather than to the belt of westerly winds, that we owe most of our rainfall.

THE BEAUFORT SCALE OF WIND FORCE

| <i>Beaufort Number</i> | <i>Admiral Beaufort's General Description of Wind</i> | <i>Specification for use on Land, based on observations made at British Land Stations</i> | <i>Limits of Mean Velocities Statute Miles per Hour as recorded by well-exposed anemometers about 40 feet above ground</i> |
|------------------------|---|---|--|
| 0 | Calm . . . | Calm; smoke rising vertically | Less than 1 |
| 1 | Light air . . | Direction of wind shown by smoke drift | 1-3 |
| 2 | Slight breeze | Wind felt on face; leaves rustle | 4-7 |
| 3 | Gentle breeze | Leaves and small twigs in constant motion; wind extends light flag | 8-12 |
| 4 | Moderate breeze | Raises dust and loose paper; small branches are moved . . | 13-18 |
| 5 | Fresh breeze . | Small trees in leaf begin to sway; crested wavelets on inland waters | 19-24 |
| 6 | Strong breeze | Large branches in motion; whistling heard in telegraph wires . | 25-31 |
| 7 | Moderate gale | Whole trees in motion; inconvenience felt when walking against wind | 32-38 |
| 8 | Fresh gale . . | Breaks twigs off trees; generally impedes progress . . . | 39-46 |
| 9 | Strong gale . . | Slight structural damage occurs (chimney-pots and slates removed) | 47-54 |
| 10 | Whole gale . . | Seldom experienced inland; trees uprooted | 55-63 |
| 11 | Storm | Very rarely experienced; accompanied by widespread damage . | 64-75 |
| 12 | Hurricane . . | | Above 75 |

ANTICYCLONES

These are, in many respects, the exact opposite of depressions, for they are areas of high pressure; they generally

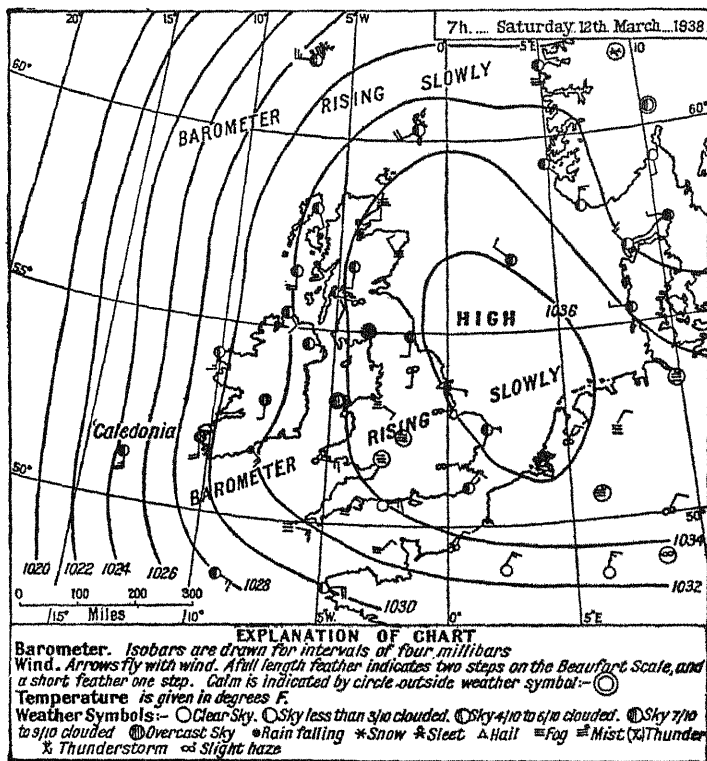
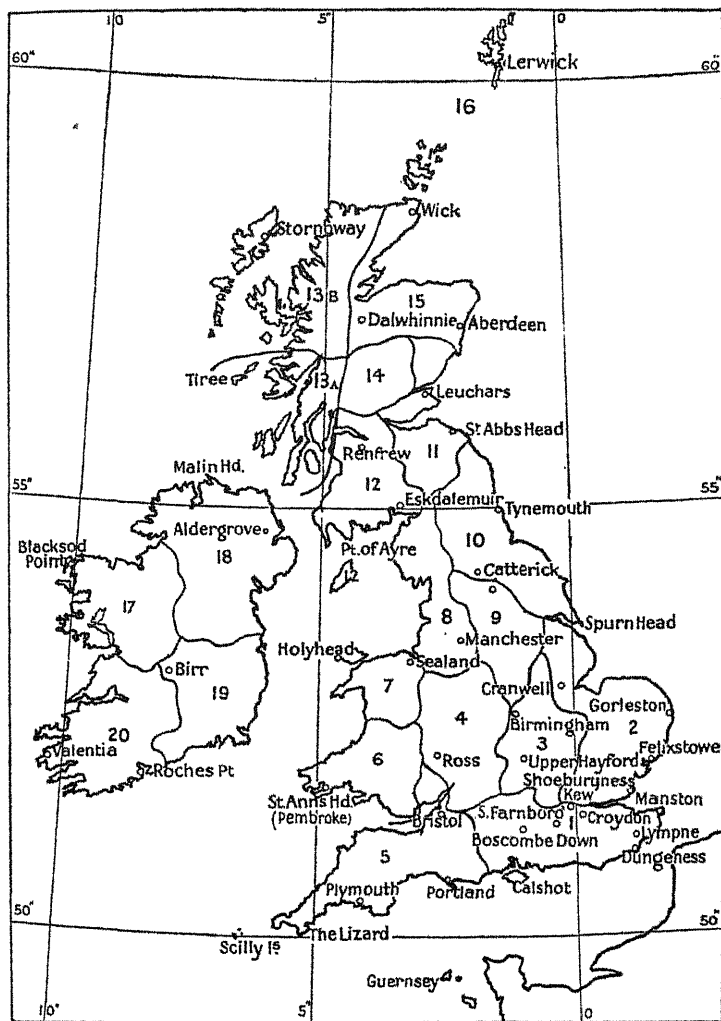


FIG. 23. A TYPICAL ANTICYCLONE

Map based on the daily weather report, by permission of the Air Ministry.

remain stationary for many days, and they are generally accompanied by periods of settled weather—hot, sunny spells in summer, and frosty or foggy periods in winter.



- | | | | |
|------------------|--------------------|---------------------|-------------------|
| 1. England, S.E. | 6. Wales, S. | 12. Scotland, S.W., | 16. Orkneys and |
| 2. England, E. | 7. Wales, N. | and Isle of Man. | Shetlands. |
| 3. Midlands, E. | 8. England, N.W. | 13A. Scotland, W. | 17. Ireland, N.W. |
| 4. Midlands, W. | 9. Midlands, N. | 13B. Scotland, N.W. | 18. Ireland, N.E. |
| 5. England, S.W. | 10. England, N.E. | 14. Mid. Scotland. | 19. Ireland, S.E. |
| | 11. Scotland, S.E. | 15. Scotland, N.E. | 20. Ireland, S.W. |

FIG. 24. WEATHER FORECAST DISTRICTS

By permission of the Air Ministry.

CHAPTER III

MAJOR CLIMATIC DIVISIONS

CLIMATIC BELTS IN EUROPE AND THE WESTERN SIDE OF AFRICA

NEAR the Equator are the *doldrums*, a belt of low pressure which is probably due to the rising of the heated air. As the air rises, winds are drawn in from north and south, and are deflected by the rotation of the earth so that they blow from the north-east and the south-east respectively. These *trade*

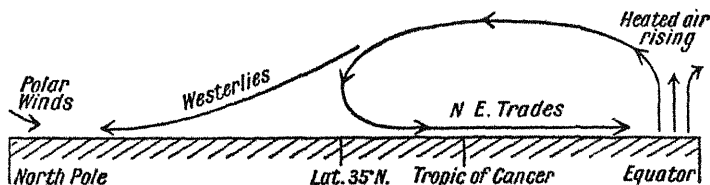


FIG. 25. PLANETARY WINDS IN THE NORTHERN HEMISPHERE

winds, as they are called, blow towards the Equator with great regularity throughout the year.

In the northern summer when the vertical sun is north of the Equator, the dividing line between the north-east trades and the south-east trades is also north of the Equator, and north-east winds are experienced as far north as the Mediterranean. In the southern summer the vertical sun is south of the Equator, and the belts of trade winds are drawn south also.

In the latitude of western Europe the prevailing winds would be from the south if the earth were still, but the rotation of the earth deflects them so that they blow from the south-west.

In the southern hemisphere there is a similar belt of winds blowing from the west and north-west. In the northern summer the belt of westerly winds does not extend further south than northern Spain, but in winter the westerly wind belt is over the Mediterranean.

It should be noted (see above) that whereas the Mediterranean region has westerly winds in winter it has the trade winds in summer.

Summing up the above facts we note the following belts of winds: (see Fig. 26.)

1. In the cool-temperate region between the Arctic Circle and latitude 40° N., the south-westerly winds all the year.
2. In the latitude of the Mediterranean (30° N. to 40° N.), the south-westerlies in winter and the north-east trades in summer.
3. In tropical and sub-tropical regions, the north-east trades all the year.
4. Near the Equator, the belt of calms or the doldrums.
5. In tropical and sub-tropical latitudes south of the Equator, the south-east trades.
6. In southern 'Mediterranean' latitudes (30° S. to 40° S.), westerlies in winter and trades in summer.
7. In the cool-temperate zone of the southern hemisphere, north-westerly winds all the year. (As there is little land in this latitude in the southern hemisphere the winds blow with great force and regularity, and they are sometimes known as the Roaring Forties or the Brave West Winds.)

RAIN BELTS ON THE WESTERN SIDES OF CONTINENTS

At the Equinoxes—21st March and 22nd September—the midday sun is vertically overhead at the Equator and the temperature is consequently very high (about 80° F.). The

hot air rises, and as it rises it expands and cools, causing heavy rain. As already explained, rainfall formed by such uprising currents is known as convection rain, and the belt of rainfall round the Equator is known as the convection rain belt.

In the northern summer when the vertical sun moves north of the Equator, the convection belt also moves north in its wake. It does not, however, get as far north as the vertical sun does, and in June when the sun is overhead at the Tropic of Cancer the convection belt extends only to latitude 20° N.

Similarly, in the southern summer the convection belt is mainly south of the Equator, but never extends much further south than 20° S.

It will be seen from Fig. 26, which shows diagrammatically the positions of the vertical sun and the convection belt in various months, that the region between 15° N. and 15° or 20° S. may be divided into three belts, viz.:

1. The Equatorial region, which is always in the convection belt, and so has some rain in every month, though it has the maximum about each equinox, when the sun is vertically overhead.

2*a*. The Sudan region, between latitudes 8° N. and 15° N., which has rain in the northern summer only.

2*b*. The southern Sudan region which has rain in the southern summer only.

The belts of trades and westerlies give us the following climatic regions:

3*a*. The Sahara, which is in the trade wind belt all the year round. These winds are dry because they blow towards the Equator, that is, from cooler to warmer regions, and also because they generally blow from land to sea. Consequently the Sahara is an almost rainless desert.

3*b*. In the southern hemisphere, the south-east trades

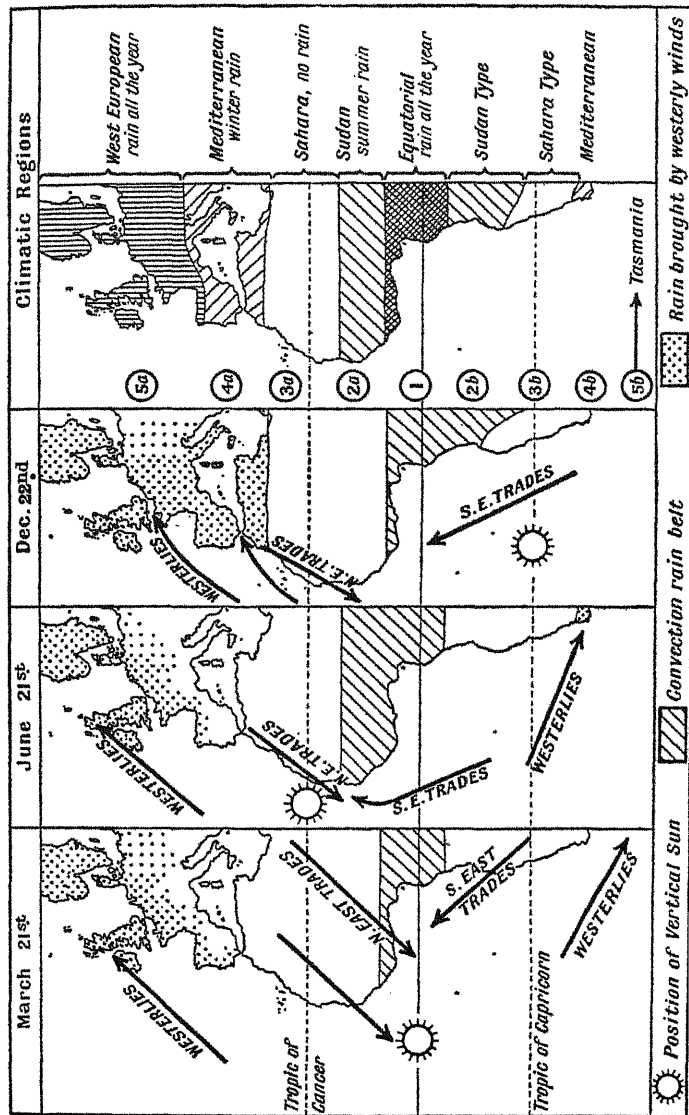


FIG. 26. WIND AND RAIN BELTS

cause deserts in roughly the same latitudes as the Sahara, though these deserts do not extend across the continents.

4a. The Mediterranean region (latitudes 30° – 40°), which is in the westerly wind belt in winter and in the trade wind belt in summer. The westerlies are wet because they blow from the sea to the land, while the trades, even when they blow over the sea, are rather dry winds. Consequently the Mediterranean region has warm, wet winters and hot, dry summers. (As in western Europe, the winter rain of the Mediterranean is largely due to depressions which are experienced in the region in winter, but not in summer.)

4b. In the southern hemisphere between latitudes 30° and 40° are winter-rain and summer-drought regions corresponding to the area round the Mediterranean Sea.

5a. Western Europe is in the belt of westerly winds all the year round and experiences depressions all the year; it has, therefore, rain at all seasons.

5b. In the southern hemisphere, Tasmania, the South Island of New Zealand, and the southern end of Chile lie in the same latitude as western Europe and have therefore a similar type of climate.

6. The Tundra is the sub-polar and Arctic region where, in spite of the long, cold sunless winters, there is sufficient warmth and sunlight in the course of the year to allow the growth of moss, dwarf shrubs, and short-lived summer-flowering plants. The Antarctic Ice Cap precludes the possibility of any extensive Tundra region in the southern hemisphere.

CLIMATIC REGIONS ON THE WESTERN SIDE OF AMERICA

(See the map of climatic regions at the end of the book)

In the above discussion of climatic regions we have only referred to the western sides of Europe and Africa, but almost

the same succession of climatic regions may be noted on the western side of North and South America. Certain important differences should, however, be noted.

1. The climatic belts are much narrower in America than in Europe and Africa. This is because the Rocky Mountains in North America and the Andes in South America lie close to the west coast, thus restricting the effects of the winds to a comparatively narrow coastal region.

2. In North America the mountainous Alaskan Peninsula occupies a position corresponding to Scotland and Scandinavia. Consequently the area of west European type of climate does not extend as far north in North America as in Europe.

3. In Central America the narrowness of the isthmus prevents the typical development of a true Sudan type of climate.

4. The area of equatorial climate in the Amazon Basin extends only to the east coast, whereas the corresponding equatorial area in Africa extends only to the west coast.

5. South of the Equator the Chile-Peru desert extends almost to the Equator, whereas the Sahara is nowhere less than 1,000 miles from the Equator.

6. Southern Chile, which corresponds to western Europe in climatic type, is exceedingly wet because the winds are compelled to rise suddenly to a great height on encountering the Andes.

CLIMATIC REGIONS OF AUSTRALIA AND THE EAST INDIES

1. The equatorial region of the East Indies, Malaya, Ceylon, and New Guinea corresponds to the regions of equatorial climate in Africa and the Amazon Basin.

2. The northern part of Queensland and northern Australia has summer rain and is therefore of the Sudan type of climate.

3. The great Australian desert corresponds to the Kalahari Desert in South Africa and to the Chile-Peru desert in South America.

4. The south coast of Australia and the North Island of New Zealand are in Mediterranean latitudes and so receive the westerlies in winter and the trades in summer. The south-western and south-eastern corners of Australia have a typical Mediterranean climate, but the North Island of New Zealand receives rain from both the westerlies in winter and the trades in summer, consequently its climate is not truly Mediterranean in type.

5. Tasmania and the South Island of New Zealand have the westerlies all the year round, and have, therefore, a climate similar to that of north-western Europe.

MONSOONS

The word 'monsoon' comes from the Arabian word meaning 'season.' The monsoon wind is a seasonal wind, that is, a wind which blows continuously in a certain direction during one period of the year and in the opposite direction during another period. The chief area experiencing monsoon winds is south-eastern Asia, that is, India, Indo-China, China, and Japan.

In winter the monsoon blows outwards from the cold interior of Asia. The rotation of the earth deflects these winds so that they become north-east winds over India and north-west winds over China and Japan. Winter monsoons are dry winds because they blow from the land to the sea.

In summer the winds are drawn inwards to the heated interior of Asia. The rotation of the earth deflects these winds so that they become the south-west monsoon over India and the south-east monsoon over China and Japan.

In both cases, however, the summer monsoons are wet, as they blow from the ocean to the land. The monsoon regions, therefore, are characterized by dry winters and very wet summers.

CLIMATES ON THE EASTERN SIDES OF CONTINENTS

(a) *The cool-temperate east coasts.* We have already seen that in the latitude of western Europe, the eastern sides of North America and Asia are very cold in winter since the winds blow outwards from the cold interior to the coasts. These regions, however, receive snow in winter and rain in summer from the depressions which pass over them; consequently they are wet at all seasons like the western European area.

(b) *The tropical and sub-tropical east coasts.* On the eastern sides of the continents the trade winds blow from the sea to the land, and consequently the eastern coast-lands which lie in the same latitudes as the hot deserts receive fairly heavy rain at all seasons, though they have a definite summer maximum.

THE CONTINENTAL INTERIORS

Rainfall naturally diminishes with increasing distance from the sea. Consequently the interiors of the wide continents of North America and Asia receive little rain at any time of the year. They are, as we have seen, very cold in winter and much snow falls in this season. In summer some rain is caused by the winds which are drawn inward to the heated interiors. In North America the prairies of Canada and the upper Mississippi basin belong to the Continental Interior type of climate and receive sufficient rain for the growth of grass and the cultivation of crops. In Asia the east to west

belt of steppes corresponds to the prairies, but the continent is so large, and there are so many high mountain ranges that large parts of the centre are almost rainless. Here, therefore, we find the cold deserts such as the Gobi.

OCEAN CURRENTS

When the winds blow constantly in one direction the surface waters of the ocean begin to drift in the same direction. This fact is well illustrated in the Bay of Bengal, where the north-east monsoon of winter causes the ocean currents to flow from the north-east, while the south-west monsoon of summer causes the currents to flow from the south-west. (Note that while a wind is named by the direction it blows from, a current is named by the direction towards which it flows.)

The principal ocean currents can easily be learned with reference to the prevailing winds; thus, in the Atlantic Ocean the North Equatorial current and the South Equatorial current are caused by the trade winds. The North Equatorial current is deflected by the west coast of North America, and part of it enters the Gulf of Mexico and swirls out of the strait south of Florida to join the other branch of the current. The combined current then flows north-east across the Atlantic as the warm Gulf Stream, whose waters are drifted towards north-western Europe by the prevailing westerly wind.

South of the Equator the corresponding South Equatorial current is split by the north-eastern shoulder of Brazil; one-half turns northward, and eventually joins the Gulf Stream, while the other half is turned southward by the coast of Brazil and becomes the warm Brazil current, which corresponds to the Gulf Stream. These currents are, of course, taking water from the equatorial regions and sending it towards the poles.

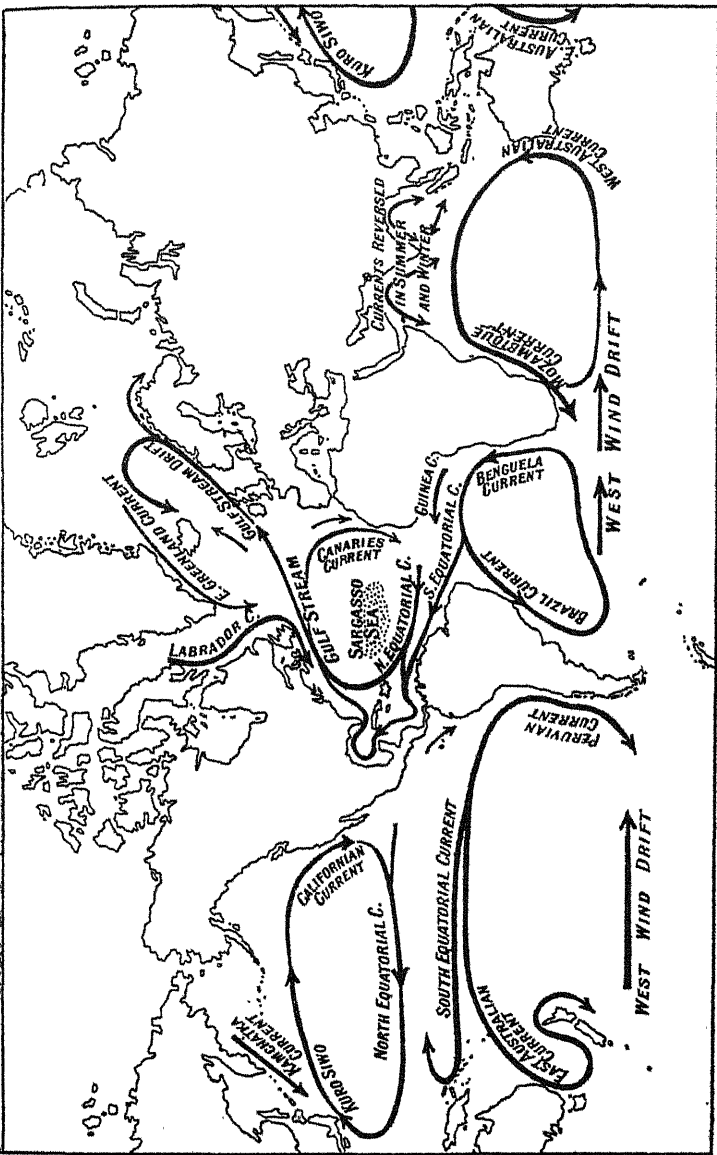


FIG. 27. OCEAN CURRENTS

If this were to continue there would eventually be a lowering of the level of the sea off the west coast of Africa. This is prevented by the in-drawing of water from north and south, giving the Canaries current in the northern hemisphere, and the Benguella current in the southern hemisphere. It will be noted that these currents of the Atlantic Ocean form two close circuits or a figure 8.

One other Atlantic current must be noted. This is the cold Labrador current which flows down the west coast of North America and returns to the Atlantic the excess of water derived from the Gulf Stream.

Fig. 27 shows that the currents of the Pacific Ocean form similar closed circuits north and south of the Equator. Here the Kuro Siwo, or Japan current, corresponds to the warm Gulf Stream, the Californian current to the Canaries current, and the Humboldt current to the Benguella current. Off the shores of north-eastern Asia the cold Kamchatka current, flowing from the north, corresponds to the Labrador current.

In the southern half of the Indian Ocean there is a closed circuit of currents, the Mozambique current corresponding to the Brazil current of the Atlantic, and the West Australian current to the Benguella current. North of the Equator the currents are reversed in summer and winter as the winds blow in opposite directions in these seasons.

HOW OCEAN CURRENTS AFFECT CLIMATE

It will readily be understood that cold currents in general make neighbouring coast-lands colder than they would otherwise be, while warm currents tend to make the climate warmer. The effect of the current is, however, only very noticeable when the wind blows from the sea to the land; moreover, the effect

of the ocean current on the temperature is always very much less than the effect of the winds.

Ocean currents also affect the rainfall. The wind blowing over a warm current will itself be warm, and so able to pick up much moisture; consequently when it reaches the land it will be able to deposit much rain, and in these regions where winds blow from the ocean over warm currents the rainfall is heavier than it would be if the warm current did not exist. Among the regions where heavy rainfall is due in part to warm currents are the east coast of South Africa and the east coast of Australia. When the wind blows over a cold current towards the land the mixing of the moist air with the cold air over the cold current often causes the condensation of moisture in the form of fog and when the wind reaches the land it is a dry wind. The Atacama Desert, for example, is much drier than it would be but for the existence of the cold Humboldt current which robs any westerly winds of their moisture before they reach the land.

CLIMATIC REGIONS OF THE TROPICS

I. EQUATORIAL REGIONS

These are the regions about the Equator which are within the convection belt practically all the year. There is little variation in the length of day, the sun rising in the east about 6 a.m. and setting in the west about 6 p.m. At the Equator the midday sun is overhead only at the Equinoxes, 21st March and 22nd September (see Fig. 9). On 21st June, when the midday sun is over the Tropic of Cancer, and on 22nd December, when it is over the Tropic of Capricorn, the elevation of the sun is $66\frac{1}{2}^{\circ}$ ($90^{\circ}-23\frac{1}{2}^{\circ}$).

As the sun shines for about twelve hours each day, and with

MAJOR CLIMATIC DIVISIONS

approximately equal intensity, there is little seasonal variation in the temperature (see Fig. 29, where the average for each



FIG. 28. EQUATORIAL REGIONS

month is seen to be about 80° F. and the range of temperature only 6°). The third factor making for equability of temperature is the dampness of the atmosphere and the presence of

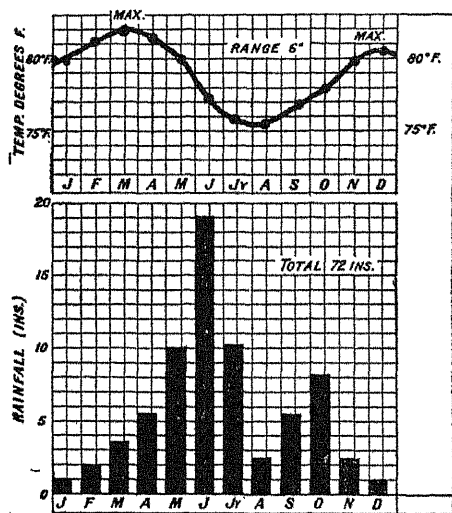


FIG. 29. TEMPERATURE AND RAINFALL GRAPH FOR LAGOS

Similar graphs should be made for each climatic region.

clouds, which delay the heating effect of the vertical sun and prevent rapid cooling when the sun is far to the north or south. In addition, the clouds act as a sunshade during the

day and as a blanket during the night, so that there is little difference between day and night temperatures.

The rainfall is greatest just after the period of the vertical sun, that is, in April and October, while it is lowest about July and December when the sun is furthest from overhead. In many parts of the equatorial regions there is a short dry season which is of great value in enabling the natives to clear the ground by burning the undergrowth.

MODES OF LIFE

1. *Nomadic hunting and collecting.* In the densest parts of the forest, where there is no dry season, cultivation is impossible. Here the only inhabitants are such tribes as the Pygmies, who obtain their living by hunting the wild animals and collecting grubs, fruit, and edible roots and leaves. As both game and vegetable foodstuffs are scarce, Pygmies are nomadic, i.e. they have to be constantly on the move. Their houses are temporary shelters constructed of the branches of trees, their only utensils a few cooking pots, their only other possessions bows and arrows, spears, and hunting sticks. In spite of the difficult conditions under which they live they are an exceedingly cheerful people.

2. *Hunting and shifting agriculture.* Where a short dry season enables the natives to burn the undergrowth, some farming is possible. Tribes such as the Fangs combine hunting and agriculture, the men doing the hunting while the women look after the plantations. Each year, however, a new plantation has to be made, consequently the land in the vicinity of the village soon becomes worthless, and every few years the tribe moves on to a different part of the forest.

3. *Native plantations.* In the still less dense parts of the forest, where the dry season is several weeks in extent, the

natives depend almost entirely on agriculture. They devote most of their time to the cultivation of their food crops, such as maize, bananas, and vegetables, but they usually have some plots devoted to the production of a money crop. The chief of these money crops in the equatorial regions of West and Central Africa are cocoa on the Gold Coast, and palm oil in Nigeria and Sierra Leone.

4. *White-owned plantations.* In certain parts of the equatorial regions white men have acquired land which has been cleared by native labour. On such lands crops required by people of the temperate zones are produced. The chief of such plantation crops is rubber.

PRODUCTS OF EQUATORIAL REGIONS

Coco-nuts. The coco-nut palm grows to a height of about eighty feet and has a crown of large leaves each about eighteen feet in length. The fruits or nuts grow in clusters near the centre of the crown, each tree bearing up to a hundred nuts a year. Each nut is surrounded by an outer layer of coir which is composed of closely matted fibre, and within the shell of the nut is the white flesh or 'meat.'

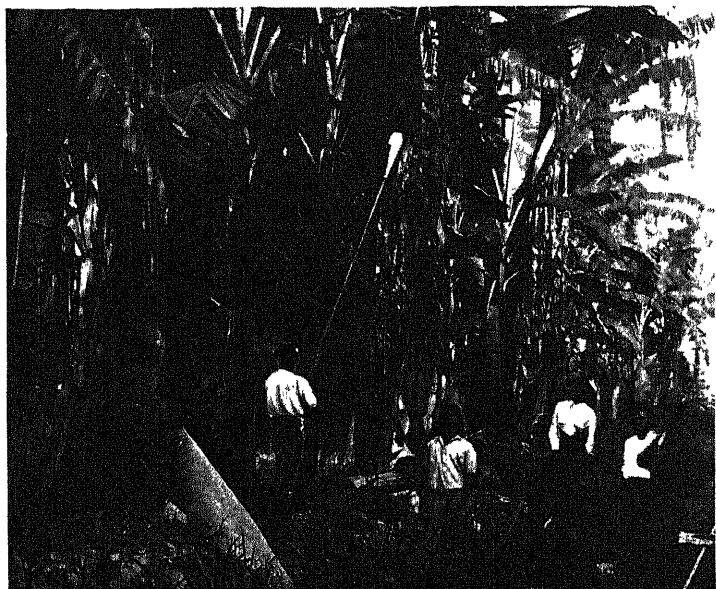
Coco-nut palms grow only in those equatorial or tropical regions which have a rainfall of 80 to 120 inches well distributed throughout the year, and an average monthly temperature of about 80° F. Alluvial flats exposed to mild sea breezes suit the tree best, but it can be grown on gentle slopes up to an altitude of 2,000 feet.

The method of gathering the nuts varies with the locality. In the West Indies the native climbs the tree trunk with the aid of a rope which passes round both tree and body. In this way he can use both hands for the work and can gather over a thousand nuts per day. In the East Indies notches are



GATHERING COCO-NUTS

Federated Malay States



CUTTING BANANAS

Elder and Fryfes

cut in the stem, and as the native has to hold on with one arm, he is able to gather only about 500 nuts per day.

After gathering, the nuts are husked and cracked and the meat exposed to the sun. The dried coco-nut 'meat,' which is known as copra, is exported to Europe and America, where copra-oil is obtained by crushing between heavy rollers. The oil is used in the manufacture of margarine, soap, candles, embrocations, etc. The residue from the crushing mills is

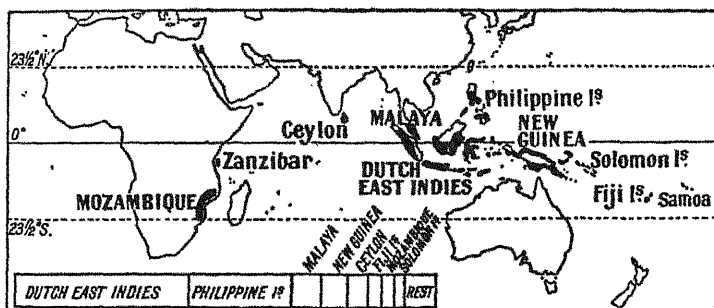


FIG. 30. COPRA-PRODUCING AREAS

used as cattle-cake, and small quantities of coir are used for making coco-nut matting and ropes.

Though the coco-nut palm will grow on nearly all the moist coastal plains throughout the tropics, plantations are completely successful only where conditions of climate and soil are nearly ideal, and where transport and native labour are cheap and efficient. The chief producers of copra are the Dutch East Indies and the Philippine Islands which provide respectively 34 per cent and 30 per cent of the total world exports. The only other notable producing areas are Malaya, New Guinea, Ceylon, Mozambique, and the South Sea Islands.

A considerable portion of the copra is produced by natives

from their own plantations, but there are also many white-owned plantations in Java, Ceylon, and Malaya. Here the trees are planted in straight lines about 30 feet apart each way. The trees begin to bear nuts when they are about six years old, and after their ninth or tenth year, yield 50 to 100 nuts per annum. A well-managed plantation will yield at least half a ton of copra per acre per year.

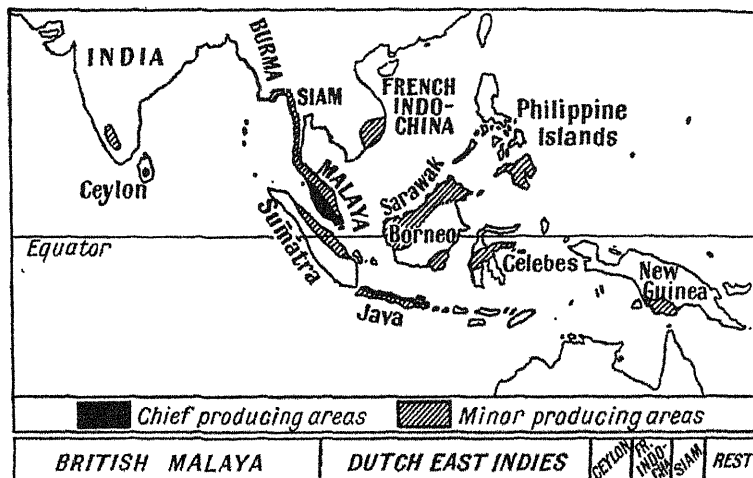


FIG. 31. RUBBER-PRODUCING AREAS

Rubber. Rubber is obtained, not from the sap of the rubber tree, but from the latex, an entirely different fluid which oozes out when cuts are made in the bark. Until the beginning of the twentieth century practically all the world's rubber was obtained from trees which grew wild in the Amazon forests. In 1876 several thousand seeds of rubber trees were smuggled from Brazil to Kew Gardens, and from these a few plants were sent to Ceylon and Singapore. These trees thrived so well, and the demand for rubber was so great,

that planting was soon undertaken on an enormous scale; now no less than 40 per cent of the world's rubber comes from Malaya, 33 per cent from the Dutch East Indies (Java, etc.), and about 5 per cent from Ceylon, while the Amazon basin produces less than 1 per cent of the world's total.

In Ceylon, Malaya, and the Dutch East Indies, most of the plantations are owned and managed by whites, but there are also innumerable small plantations owned and worked by the natives themselves. The white-owned plantations are generally situated on well-drained land less than 2,000 feet above sea-level. Each acre of ground supports about eighty full-grown trees and produces one thousand to two thousand pounds of rubber annually.

The latex is obtained by tapping the trees by means of a system of shallow cuts which usually slope downwards from left to right into a vertical channel from which the latex runs into a collecting cup. In the factory which is attached to the plantation, the latex is made into sheet or *crêpe* rubber by treating it with chemicals.

Palm oil. The oil palm is similar in appearance to the coco-nut palm, but it bears large clusters of plum-like fruits growing together in large, densely packed masses weighing up to a hundred pounds each. Each single fruit consists of a hard kernel surrounded by soft pulpy flesh. The natives boil or squeeze the flesh, thus obtaining palm oil. The nuts are cracked and the kernels sold to white traders who export them to Europe and America, where palm-kernel oil is extracted by passing them between heavy rollers. Palm oil and palm-kernel oil are used for the manufacture of margarine, soap, etc.

The home of the oil palm is the hot wet coastal plain of West Africa, and Nigeria produces 45 per cent of the world's output of palm oil and palm-kernel oil. In these areas the

production is almost entirely in the hands of the natives, and their so-called plantations are merely natural stands of palms which grow with no other aid than the clearing of the larger weeds. In the Congo basin and Sumatra, however, white-owned plantations have been established in recent years, and these yield greater quantities of better quality palm oil than the native palmeries of West Africa.

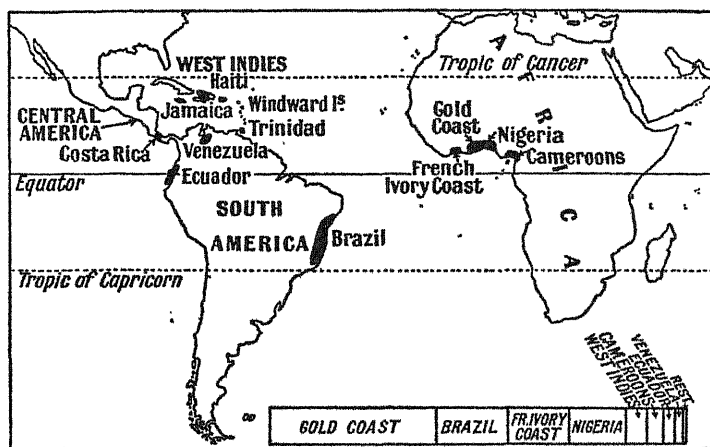


FIG. 32. COCOA-PRODUCING AREAS

Cocoa. The cocoa tree grows to a height of twenty or thirty feet, and the fruit consists of large red or yellow pods which are attached to the trunk by a short stem. The cocoa beans are embedded in a soft fleshy mass and are prepared for the market by fermenting and drying.

The chief cocoa-producing area is the Gold Coast colony in West Africa. As in the case of the palm-oil industry of Nigeria the production of cocoa in the Gold Coast is almost entirely in the hands of the natives. Little care is taken of the planta-



Mondiale
OIL PALMS, CAMEROONS



P. B. Redmayne
COCOA BEANS, GOLD COAST

tions, but so favourable are the climate and soil that the colony produces nearly half the world's cocoa.

Other important cocoa-producing areas are shown in Fig. 32. Trinidad produces some of the world's finest cocoa, and on the hot, wet coastal plain of the north-west corner of South America—Ecuador, Colombia, and Venezuela—small quantities of good quality cocoa are produced by the natives and half-bred inhabitants.

Brazil nuts grow packed close together inside a hard spherical shell. When ripe, this hard, heavy ball falls from the tree scattering the nuts over the ground, whence they are scooped up by the native. Practically all the world's supply of brazil nuts comes from the Amazon basin. The oil obtained from the nuts is used chiefly in the manufacture of confectionery.

FOREST PRODUCTS

Timber. In spite of the abundance of valuable trees, equatorial regions do not supply very large quantities of timber to the world's markets. Factors which prevent the development of the industry in these regions are:

1. There are relatively few trees of commercial value, and these are surrounded by hundreds of others which often prove an insuperable barrier to lumbering. The difficulty of locating trees of a particular type is illustrated by the fact that in British Honduras the lumbermen are known as 'mahogany hunters.' Even when the trees have been located transport presents such difficulties that only those growing close to navigable rivers are worth cutting.

2. The hot, wet, unhealthy climate hinders lumbering operations and saps the vitality of the workmen.

Consequent upon these factors, only small quantities of

relatively valuable cabinet woods, such as mahogany and ebony, and dye woods, such as logwood, are exported from the equatorial forests.

II. THE SAVANNAH LANDS (SUDAN TYPE)

We have seen that there are, north and south of the equatorial belt, regions which are in the convection rain belt in summer only. These areas are known as savannah lands, because the characteristic vegetation is savannah, or tropical grass; alternatively, they are known as the Sudan lands because the largest and most typical area is the Sudan of Africa which stretches across the continent between the equatorial forests and the Sahara.

There is, of course, no sharp line of division between the savannah lands and the adjoining natural regions. Near the edge of the equatorial forest area are the park savannahs, so called because the clumps and lines of trees give them, from a distance, the appearance of an English park land; and on the poleward or desert side the true savannahs give place to scrub and semi-desert. These variations in vegetation correspond to and are caused by a gradual diminution of the amount and duration of the rainfall as we go further from the Equator. Thus a station near the southern edge of the Sudanese savannah land may have a rainfall of 50 inches, spread over six or seven months; a station near the middle of the savannah belt may have a rainfall of 30 inches, spread over three months; and a station in the marginal scrub land of the north may have only one or two rainy months and a total precipitation of only 10 or 12 inches.

Comparison of the temperature statistics on page 99 shows that the savannah lands have much higher summer temperatures than the equatorial regions. The reason for this is

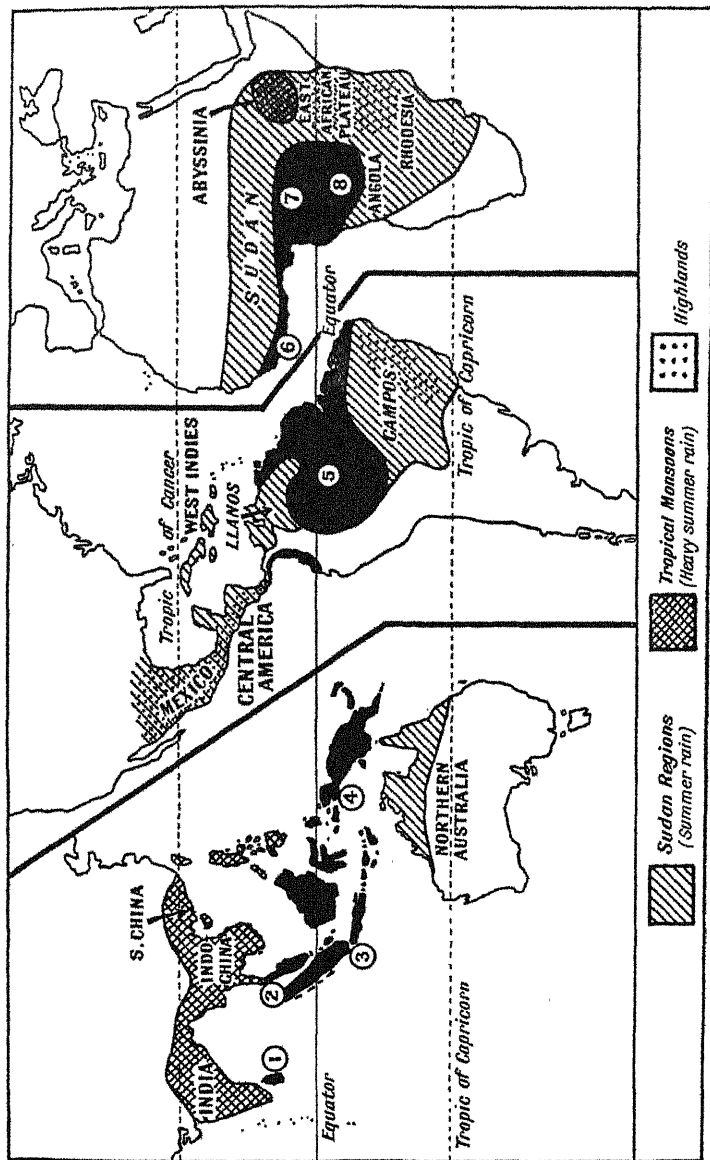


FIG. 33. THE SUMMER RAIN AREAS OF THE TROPICS, WITH REVISION OF THE EQUATORIAL AREAS
(In black, and numbered (1) to (8))

threefold: (1) In summer the sun is vertically overhead, not at the Equator, but in the savannah region. (2) In the savannah lands there are fewer clouds to shade the land from the full heat of the sun. (3) At midsummer the sun shines for thirteen to fourteen hours on the savannahs, whereas at the Equator it shines for only twelve hours per day.

The grasses of the savannahs grow with great rapidity during the hot, moist summer, and in the wetter areas form large tracts of jungle in which live such fierce carnivores as the lion, tiger, and hyena, while the drier and more open grasslands are the home of such fleet-footed animals as the antelope in Africa, the kangaroo in Australia, and the rhea in South America.

FARMING ON THE SAVANNAHS

As might be expected from the abundance of grass one of the chief occupations on most of the savannah lands of the world is cattle rearing. There are, however, many drawbacks to cattle rearing on a commercial scale in these areas, the chief being:

1. The great heat of summer, which weakens the animals and causes the spread of diseases and insect pests. The most deadly pest is the tsetse fly, whose bite is fatal to cattle. The ravages of this fly have compelled the natives of East Africa to abandon large areas of land which formerly supported a comparatively dense population. It has, however, been proved that the advance of the fly may be stopped by burning the bush which provides breeding places, and Government fly-fighting services have now turned the scale in the campaign between man and fly for the possession of the land.

Another insect pest is the locust which occasionally swarms



LOCUSTS, S.W. AFRICA

Mondiale

in myriads over the tropical parts of Africa and America, devouring every leaf and blade of grass, thus destroying crops and depriving man and beast of the means of subsistence.

2. The long period of 'winter' drought when the animals suffer greatly from lack of water and fresh pasture.

3. The summer floods, which, in such areas as the Orinoco basin of South America, compel the cattle to crowd together on small 'islands' above flood level; there the scanty pastures are soon exhausted and many cattle die through lack of food.

4. The lack of nearby markets and of transport facilities to the coast. In the South American savannah lands almost the only way of marketing the cattle is by driving them for many hundreds of miles to the coast, which they reach in such an emaciated condition that they are often almost worthless.

5. The impossibility of governmental insistence on such precautions against the spread of disease as the periodic dipping of cattle and the erection of fences to prevent the mixing of herds.

In view of the above difficulties it is not surprising that the savannah lands supply little meat or dairy produce to the world's markets. Throughout the savannah lands of Africa—the Sudan, the East African plateau, Rhodesia, and Angola—there are numerous native tribes who depend wholly or in part on herds of cattle, which in many cases constitute the sole wealth of the tribe and the only interest of the men. Milk is, of course, an important article of diet in such tribes, but there is no market for the meat, even if the natives could be induced to sell their animals for slaughtering. Consequently the only cattle product which enters the world's markets from these regions is hides.

On the South American savannah lands—the llanos of the Orinoco basin and the campos of the Brazilian plateau—there are millions of cattle which roam about the plains under

the care of Indian and half-breed 'cowboys.' The cattle are, however, of poor quality and the lack of nearby markets has prevented the development of any noteworthy export of beef.

The grasslands of central Queensland (Australia) have a great advantage over other savannah lands in that they are underlain by water-bearing sandstones which form artesian basins. Thousands of artesian wells have been sunk into this water-bearing layer, thus providing an unfailing source of drinking water for the stock. As a consequence this region is the only savannah land which has developed any considerable meat-exporting industry, though even here the industry is handicapped by the distance from the British markets.

NATIVE AGRICULTURE ON THE SAVANNAH LANDS

Ground nuts, also known as pea-nuts and monkey nuts, are the chief 'money crop,' as well as one of the staple food crops, of the Sudanese savannah lands. They are the fruit of a small bushy plant which belongs to the pea family (hence the name pea-nut), but the nuts form in the soil round the base of the plant (hence the name ground nut). The natives grind them up to make a kind of flour and crush them to obtain oil for cooking; but wherever there is the possibility of cheap transport to the coast they sell the major part of the harvest to traders who dispatch the nuts to Europe; there they are crushed between rollers to give an oil which, like the vegetable oils of the equatorial forest region, is used in the manufacture of soap, margarine, candles, etc.

Cotton is also widely grown on the savannah lands, though all the greatest cotton-producing areas (south-eastern United States, India, China, and Egypt) lie in other natural regions.

In the African Sudan the chief cotton-producing areas are

Uganda, the Anglo-Egyptian Sudan, and Nigeria. In Anglo-Egyptian Sudan much high quality cotton is grown on the Gezira Plain, between the Blue Nile and White Nile. Here the land is irrigated from a 36-mile canal which draws water from the Blue Nile and distributes it over an area of 750 square miles. Uganda is, next to India, the chief cotton-growing country in the British Empire. The crop is grown by the natives on their own plantations, and as it is of excellent quality it finds a ready market in Lancashire. As the natives grow food crops in addition to cotton they are relatively prosperous, and have attained a high degree of civilization. In Nigeria the natives have for centuries grown cotton for their home industries, and in modern times have also produced a surplus for export.

Maize and *millet* are the chief cereals of the African savannahs, but very little finds its way on to the world's markets.

Gum arabic is collected from trees in the scrub lands on the northern margin of the Sudanese savannah lands. To obtain the gum a piece of bark is stripped off the tree causing a gentle flow of liquid which soon solidifies as crystals of gum.

III. THE TROPICAL EASTERN MARGINS

On the eastern sides of continents the trades blow from the sea to the land, and so bring considerable rain, especially where they are compelled to rise on encountering high land. These regions receive some rain at all seasons, though they have a definite summer maximum. They are, therefore, intermediate between the equatorial and the Sudan type, but are most conveniently dealt with as a subdivision of the latter type.

The chief areas with this transition type of climate are

Central America, the West Indies, the east coast of Brazil, Mozambique, Madagascar, the east coast of Queensland.

Sugar cane may be taken as the typical product of the tropical east coasts, though it is also grown in equatorial,

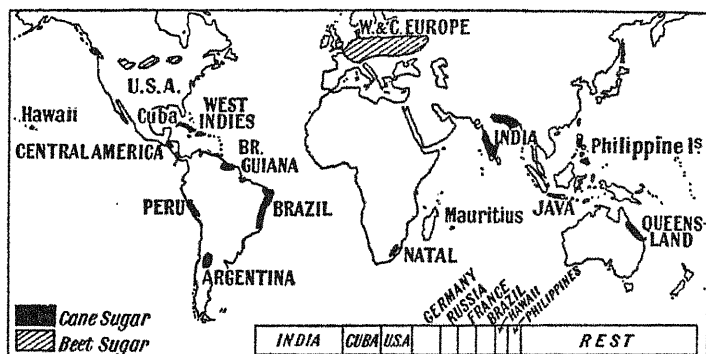


FIG. 34. THE WORLD'S SUGAR

monsoon, and warm temperate regions. The conditions necessary for the successful cultivation of sugar cane are:

1. Deep, fertile soil, sugar cane being one of the hungriest of crops.
2. Constant high temperatures, so as to allow of continuous growth throughout the year.
3. Abundant sunshine.
4. Fifty to sixty inches of rainfall, distributed in showers rather than in long wet periods.
5. A relatively dry harvest season.
6. A supply of cheap labour, as planting, cultivation, and harvesting are largely done by hand.
7. Proximity to the coast, giving accessibility to the world's markets.

India is the world's largest producer of cane sugar, but has only comparatively small amounts to spare for export.

Cuba, which is the world's leading exporter of cane sugar, has the advantage of an ideal 'sugar' climate, and soil so deep and fertile that ten or twelve crops of cane can be produced from one planting.

Java is the second largest exporter and has achieved this position largely through the scientific control of cultivation by the Government. Other large exporters of cane sugar are the Philippine Islands, Hawaii, British Guiana, and the West Indies.

Other important products of the tropical east coast-lands are bananas, oranges, grape-fruit, and cotton.

Coffee is grown in parts of several natural regions, and cannot be considered as a typical crop of any one of them; but as south-eastern Brazil produces about two-thirds of the total world supply, the commodity can most conveniently be considered in this section. The conditions necessary for the cultivation of coffee are:

1. A warm, equable climate with freedom from frost.
2. Abundant rainfall (40 to 60 inches) well distributed throughout the year.
3. Deep, well-drained soil, preferably on hill slopes between 1,500 and 3,000 feet in height and subject to moist but gentle winds from tropical seas.
4. Protection from the direct rays of the midday sun, either by a misty atmosphere or by bushes specially planted for the purpose.

In Brazil the 'coffee region' is situated on the edge of the plateau behind the ports of Santos and Rio de Janeiro, and around the city of São Paulo. In this region the climate, soil, and the elevation of the land are ideally suited to the growth of coffee, there are excellent transport facilities to the nearby ports, and the industry is concentrated in a small

MAJOR CLIMATIC DIVISIONS

area, facilitating the development of an efficient organization for marketing the coffee. Unfortunately, the ease with which coffee can be cultivated in this region has led to such extensive planting that in recent years more coffee has been grown than could be absorbed by the world's markets, and large quantities have been destroyed in an effort to keep up prices.

Other important coffee-producing regions in America are the highlands of Colombia, Venezuela, and Ecuador, the



FIG. 35. WORLD PRODUCTION OF COFFEE

various states of Central America (especially Guatemala and Salvador), and the West Indian islands of Cuba, Haiti, Jamaica, and Dominica.

In Africa the chief producing area is Kenya Colony on the high East African plateau. The coffee in this region is produced on British-owned plantations, the quality is very good, and the chief market is Britain.

In Asia the chief producing areas are the south-western corner of Arabia, where the output, though small, is of very high quality, the southern tip of India, and the Dutch island of Java.

IV. THE MONSOON LANDS

Like the savannahs the monsoon lands have hot, wet summers and warm, dry winters. (See the statistics on p. 99.) The rainfall is, however, much heavier in the monsoon lands than in the savannah lands, and is due to somewhat different causes. Whereas in the savannah lands the rain is due to the poleward swing of the convection belt, in the monsoon areas it is due to definite monsoon winds drawn in from the ocean to the overheated interior of the continent. In India, which shows the typical development of the monsoons, the winter winds are the north-east trades, which are the normal winds for the latitude. In summer, however, the interior of the continent is so hot that a strong current of air is drawn northward from far over the Indian Ocean (see Fig. 26). As these winds, which in the southern hemisphere are the normal south-east trades, pass north of the Equator, the rotation of the earth causes them to turn towards the right. They thus reach India as the south-west monsoon. It should be noted that the term monsoon is used in two senses. British people resident in India use it as synonymous with the wet season, but in geography the term is usually applied to winds which blow from the land in winter (the north-east monsoon of India), and from the sea in summer (the south-west monsoon of India).

Though there are only two 'monsoons' there are really three seasons in India: the cool, dry season of winter, the hot, dry season, and the wet season which begins with the break of the monsoon in mid-June. It should be noted that the heavy monsoon rain and the accompanying cloud so cool the atmosphere that July, August, and September have lower temperatures than the months of early summer. The moistness of the atmosphere in the wet season, however, causes the

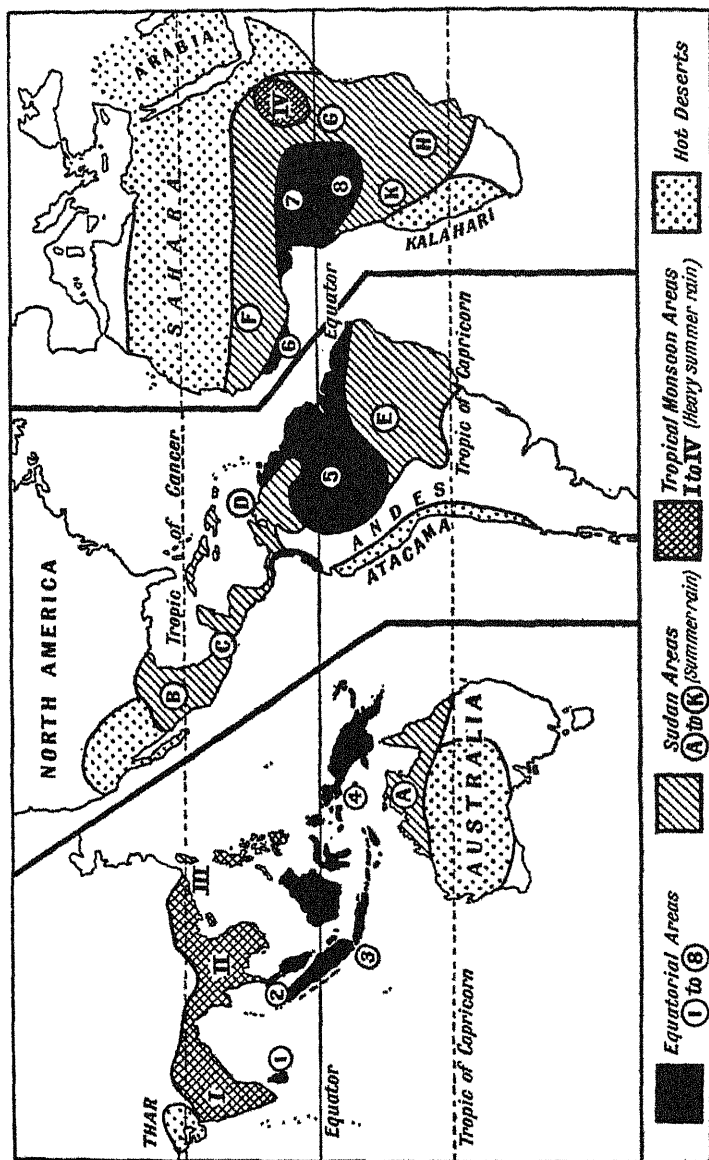


FIG. 36. THE CLIMATIC REGIONS OF THE HOT BELT (Name the areas marked with numbers and letters)

weather to be so oppressive that white people find it necessary to retire to 'the hills' for the wet season.

China and Japan also have a monsoon type of climate, but the winds blow from the north-west in winter and from the south-east in summer. Another important difference from the climate of India is that the winter winds are very cold, as they blow outwards from the cold interior of Asia.

Java and Ceylon, which have already been mentioned as equatorial areas since they have rain in both 'summer' and 'winter,' may be said to have a double monsoon climate since the winds of both summer and winter, though blowing from opposite directions, both blow from the sea and so bring ample rain throughout the year.

North America, being smaller than Asia, has not such great differences between coastal and inland temperatures as Asia, and so has no definite monsoons. In the south-east of the U.S.A., however, the summer winds are drawn in from the sea towards the over-heated interior causing heavy rainfall which may be considered as partially of the monsoon type.

POPULATION OF THE MONSOON LANDS

The monsoon lands of south-eastern Asia—India, Indo-China, the East Indies, China, and Japan—are among the most densely peopled areas in the world. In fact, though the region comprises only one-tenth of the earth's surface, it contains over 40 per cent of the world's people. Another striking fact is that though the density of population is at least as great as that in western Europe, the people of the monsoon lands depend almost entirely on agriculture, there being few large industrial centres such as those of western Europe. The chief reasons for this great density of the farming population are:

1. The high temperatures and heavy rainfall of summer

cause the crops to grow with great rapidity and to give a high yield.

2. The annual floods have covered the valleys and plains with alluvium of amazing fertility.

3. The lowland is easily irrigated—in summer from canals which distribute the flood water direct from the rivers, and in the dry season from reservoirs which store the surplus flood-water of summer. As the temperatures are always high enough for the growth of crops it is possible on irrigated land to grow two, and sometimes three, crops a year.

4. Rice, which is the principal food crop of the monsoon lands, yields more food per acre than any other cereal.

5. The inhabitants eat very little meat, and so can produce sufficient food to keep them in health from a small area of land. In England it takes two acres to produce food enough for one cow, whereas in many parts of the monsoon lands two acres produce enough food for four or five people.

PRODUCTS OF THE MONSOON LANDS

Rice or *paddy* is a swamp plant, and the ordinary varieties will grow only on land which is flooded to a depth of several inches. The crop can, therefore, only be cultivated on land which is level enough to hold water, and where there is an abundant rainfall or an unfailing supply of water for irrigation. If the map of the rice lands is compared with the relief map and with the rainfall map it will be seen that rice-growing is almost confined to those valleys and coastal plains of the monsoon lands which receive more than forty inches of rain per year.

Rice is usually sown in 'nursery beds' which are flooded to a depth of a foot or so. While the young rice is growing, the paddy fields are ploughed two or three times in different

directions, water being led on to the fields during the process. When the young plants are about six inches high they are transplanted into the paddy fields, which remain covered with water until the grain is nearly ripe. Sowing, planting, weeding, and harvesting all entail long hours of patient toil, and the yield, though high per acre, is very low in proportion to the hours of labour. Indeed, a hired farm-hand on an Indian rice-field would earn only a penny or two per day!

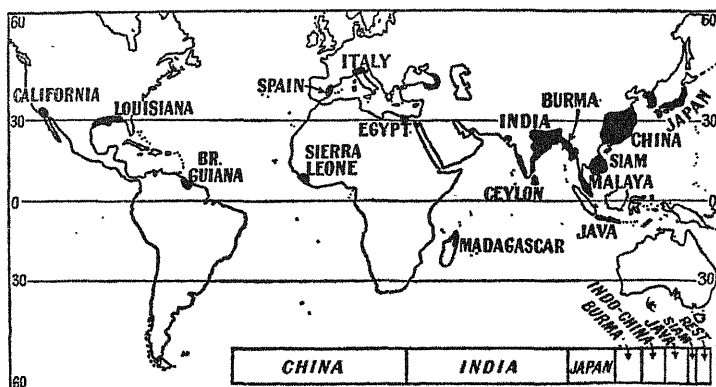


FIG. 37. RICE-GROWING AREAS

Nearly all the rice grown in south-eastern Asia is eaten by the families who produce it, and less than 5 per cent of the crop enters into world commerce. The chief rice exporting country is Burma, which has a surplus of rice because its population is much less dense than that of the major producing areas, such as the Ganges basin, southern China, and Japan.

Millet is the chief food crop in those parts of the monsoon lands which are too dry for rice and too infertile to produce good crops of wheat. The chief area of cultivation is the drier western half of India. Examination of rainfall and

temperature maps will show that this area has a climate very similar to that of the savannah lands, with which it is, indeed, often included.

Wheat requires its chief rain in the early period of growth and a warm, dry season for ripening and harvesting. In the monsoon lands it is grown only in the drier areas and, even there, it is sown towards the end of the summer rains and ripens during the warm, dry winter.

Silk is a characteristic product of the temperate monsoon lands of China and Japan, and roughly 90 per cent of the world's silk is produced in this region. The conditions which have favoured the development of silk production in this region are the warm, moist summers which ensure the luxuriant growth of the mulberry leaves on which the silkworms feed, and the abundance of cheap but highly skilled workers who demand little return for long hours of patient toil. The care of the silkworms is usually the work of the women, and though the return per hour of labour is almost infinitesimal, the silk produced is often the chief source of money income for the family. China produces roughly 70 per cent of the world's silk, and Japan about 25 per cent.

The only other areas producing appreciable quantities of silk are Korea, northern Italy, and southern France.

Tea. The conditions necessary for the cultivation of tea are deep, well-drained, fertile soil, heavy rainfall and high temperatures during the growing season, and an abundant supply of cheap labour for picking. The monsoon lands produce practically the whole of the world's tea. China produces nearly half the world's total, but as it is the universal beverage of its teeming millions, and as the surplus available for export is not carefully graded and packed, the country supplies only a small part of the world's exports. Considerable quantities are, however, sent overland to central Asia and Russia in the

form of brick tea. India produces over 20 per cent of the world's supply of tea, and is by far the most important exporting country. The chief producing regions are the hill slopes in Assam and the well-drained lowlands of the Brahmaputra valley. Most of the plantations are under British ownership and management, but the labour supply is Indian.

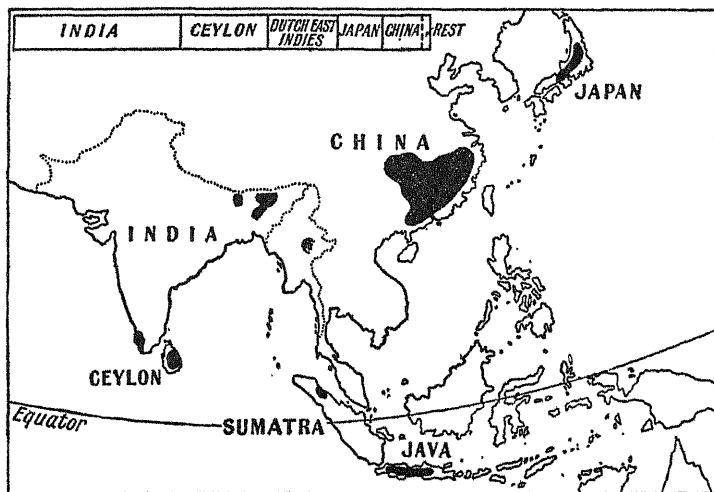


FIG. 38. TEA-PRODUCING AREAS

The strip diagram shows the *exports* only.

Ceylon ranks next to India for the export of tea, the crop being cultivated on white-owned plantations situated on the steep hill slopes.

Japan produces considerable quantities of low-grade tea for home consumption, and also specializes in the production of very high quality tea for the North American market.

Oil seeds. The chief plants of the monsoon lands which are grown for the oil obtained from their seeds are ground nuts, linseed, sesamum, and soya beans. India is the world's

greatest producer of ground nuts and supplies about half of the world's exports. The chief area of production is the south-eastern part of the Deccan. Linseed, which is the seed of the flax plant, is produced chiefly in the hot, wet plain of the Ganges. Sesamum, a small yellowish seed about the size of a pin head, is grown on the Deccan.

The *soya bean* yields a large proportion of valuable oil. In Manchuria and northern China, which are the chief areas of cultivation, it is one of the staple food crops of the people, and also one of the most valuable money crops. Manchuria supplies over three-quarters of the world's exports.

Jute is the fibre obtained from the inner bark of a plant which grows to a height of ten to twenty feet. It will grow only on land which is submerged to a depth of several feet, and the only part of the world which provides the exact conditions of climate, soil, and water supply which the plant needs is the eastern half of the Ganges delta, and this area produces practically the whole of the world's supply.

V. THE HOT DESERTS (See Fig. 36)

The chief hot deserts of the world are:

1. The Sahara of northern Africa.
2. The Arabian Desert.
3. The Thar Desert of northern India.
4. Somaliland in the north-eastern horn of Africa. (It will be seen from the map that these hot deserts of the Old World form an almost continuous belt stretching from the Atlantic coast of Africa towards central Asia.)
5. The Kalahari of South Africa (the greater part of this region is, however, merely semi-desert, only the narrow coastal strip, which is known as the Namib, being true desert).
6. The Atacama or Chile-Peru Desert on the west coast of South America.
7. The North American Desert, which includes such individual desert areas as the

Colorado Desert, the Mohave Desert, and the Painted Desert.
8. The Great Australian Desert.

All these desert areas are on the western side of their land mass, and in the belt of the trade winds, which blow from the north-east in the northern hemisphere and from the south-east in the southern hemisphere. Even where these winds blow from the sea to the land, as on the eastern sides of continents, they do not cause very heavy rainfall, and by the time they have passed over the breadth of the continent they have lost what little moisture they had picked up in their passage over the ocean. The deserts may, therefore, be said to be in the rain shadow of their continental land masses. Three points should, however, be noted in connection with the latter statement, viz.:

1. Northern Africa has the land mass of Asia on its windward side, whereas on the eastern sides of other continents the trade winds blow from the sea, consequently the Sahara is the only hot desert which extends across its continent.

2. In South America the Andes are so high and broad that the trades cannot pass over them. It is, therefore, hardly correct to say that the Atacama Desert is in the rain shadow of the Andes. The prevailing winds are, however, off-shore, so no rain-bearing winds reach the coasts.

3. Each continent has on its western side a cold current flowing towards the Equator in trade-wind latitudes—the Canaries current off northern Africa, the Benguela current off southern Africa, the Californian current off North America, the Humboldt current off South America, and the West Australian current off the Australian coast. As we have seen (p. 43) these cold currents make the neighbouring coastlands both cooler and drier than they would otherwise be.

The hot deserts, although they are almost bisected by the tropics, experience much higher summer temperatures than

the equatorial regions, since the sun is vertical at the tropic on Midsummer Day, and there are no clouds to act as a sunshade. The winters, though still warm, are rather cooler than those of the regions nearer the Equator, and the range of temperature is somewhat higher (see p. 99). More remarkable, however, than the annual range is the diurnal range, or difference between day and night temperatures. The dryness of the atmosphere and the absence of cloud allow the earth to cool very rapidly as soon as the sun has set, and the traveller who has spent the day in almost insufferable heat may shiver through the night even though wrapped in blankets.

Throughout the desert regions the annual rainfall is less than ten inches, and there are large areas with averages below one inch per year. In Peru, for example, there are places which receive only one or two short rain showers in a year, the total rainfall in an average year being only one-twentieth of an inch.

Towards the Equator the hot deserts merge gradually into a transition zone of semi-desert which, like the savannah lands, receives its maximum rainfall in the summer months. Towards the Poles the deserts merge into the Mediterranean regions which receive their chief rain in winter. Examination of the monthly rainfall averages (p. 99) will therefore show whether the station is on the poleward or Equatorward side of the desert according as the maximum rainfall comes in winter or in summer.

Contrary to the general impression, the surface of the hot deserts is not invariably sandy. In the Sahara, for example, only one-tenth of the surface is covered with sand, the remainder being stony or rocky desert. The hot deserts are not completely devoid of vegetation; even the sand dunes are usually held together by tufts of wiry grass whose long roots penetrate far into the sand; dried-up water-courses are often

marked by rows of stunted, thorny bushes; parts of the Sahara which seem at first sight to be absolutely bare of vegetation are on closer inspection found to be dotted with small whitish mounds of spiky grass matted together with clay; and in the North American desert are found the cactus plants which store water in their fleshy leaves and hollow stems.

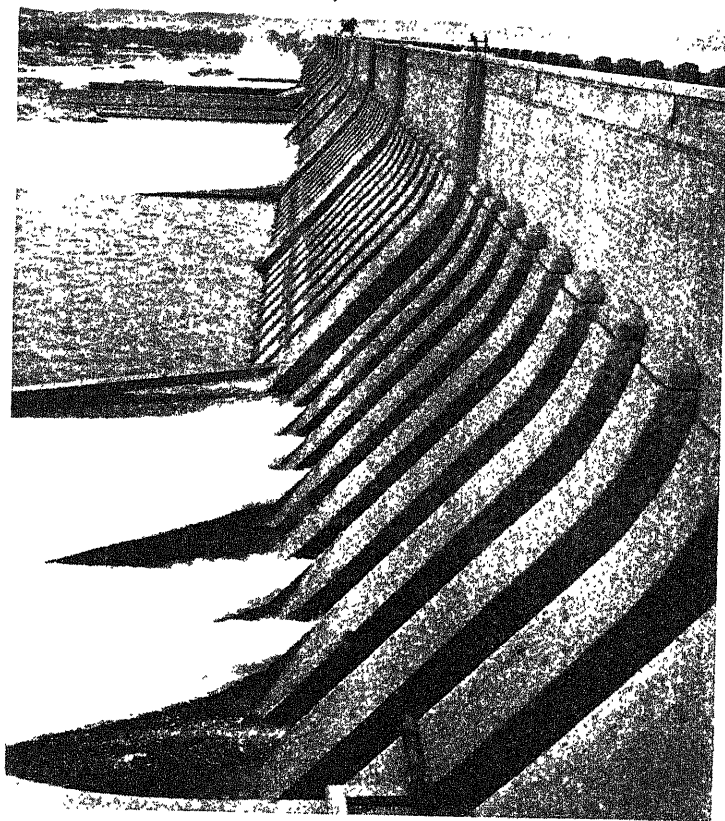
Such scanty vegetation makes human life possible over large parts of the hot deserts. In the Sahara and Arabia the nomadic Bedouins live on the products of their flocks of sheep and goats and herds of camels which they drive from pasture to pasture; in the drier parts of the Kalahari the Bushmen, a diminutive race akin to the pygmies of the Congo forest, eke out a precarious existence by hunting the few animals which contrive to live on the scanty pastures; and in Australia the aboriginal 'blackfellows' live by hunting and collecting edible roots and leaves. All such desert peoples are of necessity nomads, and as large areas are required either as hunting grounds or pasture grounds the density of population is very low indeed.

The Sahara and the northern part of the Arabian Desert are unique in having numerous oases which support a settled agricultural population. Some of the oases are supplied with water from a spring or a pool, but in the majority of cases wells have to be dug down to the water table (i.e. the surface of the saturated layer of rock under the ground). The primitive inhabitants can only dig such wells where the water table is near to the surface, but in certain parts of the Sahara French engineers have bored many deep artesian wells from which considerable tracts of the desert are irrigated. Though there are many hundreds of oases in the Sahara, and though some of them are so large as to support millions of palm trees and scores of thousands of inhabitants, the irrigated portion of the desert is only a very small part of the total area.

The inhabitants of the oases depend to a large extent on the date palms which grow 'with their heads in fire and their feet in water' and provide the people not only with food, but also with timber, fuel, and thatching materials. Though the date palm is of such paramount importance the oasis dwellers also grow such crops as wheat, barley, millet, maize, and sugar cane.

Where supplies of water can be obtained from rivers the deserts have been irrigated on a large scale. Mesopotamia, which is one of the most ancient 'cradles of civilization,' would be an absolute desert if it were not for its twin rivers, the Tigris and the Euphrates, and Egypt has depended from time immemorial upon the flood waters of the Nile. In these river valleys the inhabitants formerly irrigated the land by the simple process of allowing the flood waters to flow over the land and keeping it there as long as possible by embankments. By this 'basin' irrigation a good crop could be obtained by sowing on the soaked land as soon as the flood had subsided, and in small areas near the river a second crop could be grown by lifting the water on to the fields by such primitive devices as the *sakieyeh* and the *shadouf*. In modern times, however, Egypt, and, to a much smaller extent, Mesopotamia, have been given a constant supply of water by the construction of huge reservoirs which hold up the surplus flood water. By such 'perennial' irrigation, three crops a year can be obtained from the same area of land.

In the North American desert large areas are now supplied with water from the Colorado and Gila Rivers. The Boulder Dam on the former river is one of the world's largest artificial lakes, and holds up sufficient water to irrigate about 2,000 square miles of land, while the Roosevelt Dam on the Gila River supplies water for the irrigation of a large fruit- and cotton-growing area around the city of Phoenix.



ASSUAN DAM, EGYPT

Fox Photos

In the Peruvian part of the Atacama Desert there are numerous streams which flow from the Andes to the sea. Several hundred years ago the Incas, who had established a remarkable civilization in the Andean region long before the advent of white men, utilized these streams for the irrigation of the long strips of fertile alluvium which occupy the valleys. In modern times similar irrigation schemes permit the intensive cultivation of sugar, cotton, fruit, and cereals in these coastal valleys, but in spite of recent extensions the amount of land irrigated is less than it was in Inca times.

In spite of the numerous irrigated areas, the economic importance of the deserts is due more to the minerals they yield than to the cultivated crops. With the exception of the Sahara, Arabia, and Thar, all the deserts provide large quantities of valuable minerals. The Kalahari yields diamonds and copper; the Chilean part of the Atacama is the world's chief source of copper and of sodium nitrate, or Chile saltpetre; the Australian Desert has valuable gold deposits around Kalgoorlie and other centres in western Australia; and the North American Desert yields silver, lead, copper, gold, and borax.

CHAPTER IV

CLIMATIC REGIONS OF THE TEMPERATE ZONE

I. THE CONTINENTAL INTERIORS OF THE TEMPERATE ZONE

THE 'temperate' interiors of the continents are characterized by a rather low rainfall (5 inches to 20 inches) most of which falls in the summer half of the year. In the northern hemisphere the great size of the continents (North America and Euro-Asia) causes great temperature extremes in the interior, the winters being very cold, with much snow, while the summers are hot and sunny, with frequent showers. In the southern hemisphere the narrowness of the continents causes the climate of the interiors to be much more equable, and these areas differ from the corresponding areas in the northern hemisphere in having mild, almost frostless winters, and no snow.

The rainfall is, in general, too low for the growth of forests, but sufficient to support the growth of grass. Hence, in their natural state these continental interiors were great grasslands, which on their drier margins pass into semi-desert and desert.

The chief areas of *temperate desert and semi-desert* are the high plateaus of central and south-western Asia, western United States, and Patagonia. In central Asia there are large areas of true desert, such as the Gobi, but on the fringes of these are poor grasslands inhabited by tribes of nomadic herdsmen of whom the Kirghiz may be taken as typical. In winter they dwell

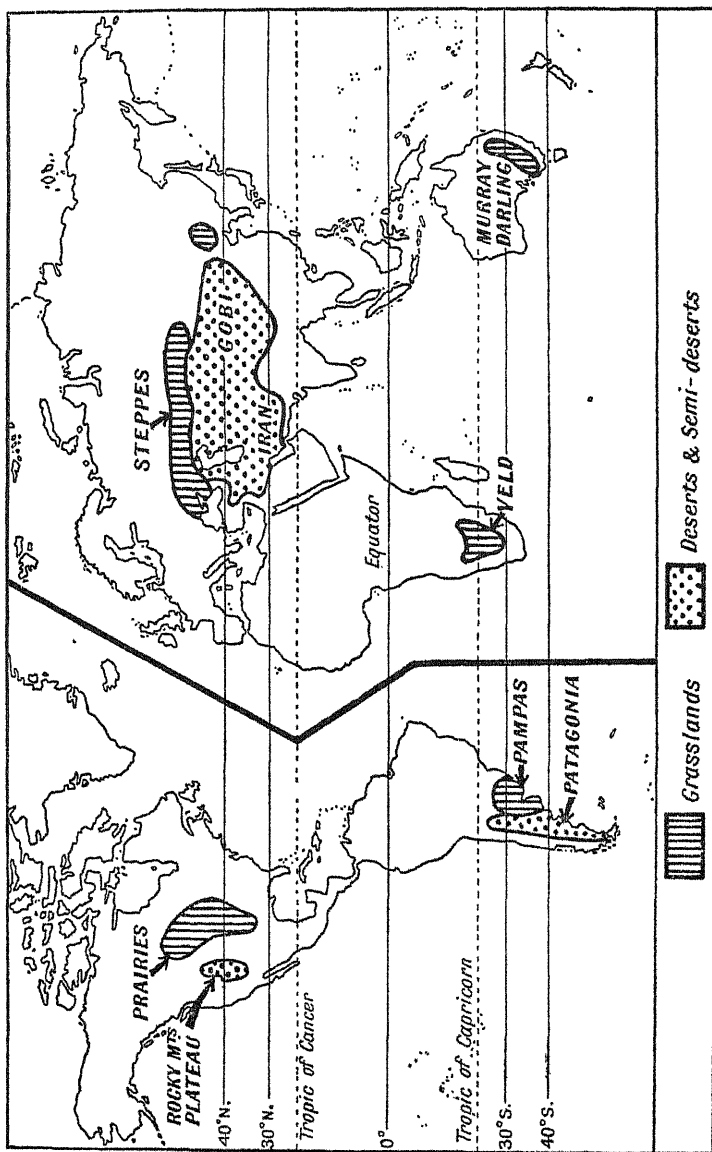


FIG. 39. THE TEMPERATE CONTINENTAL INTERIORS

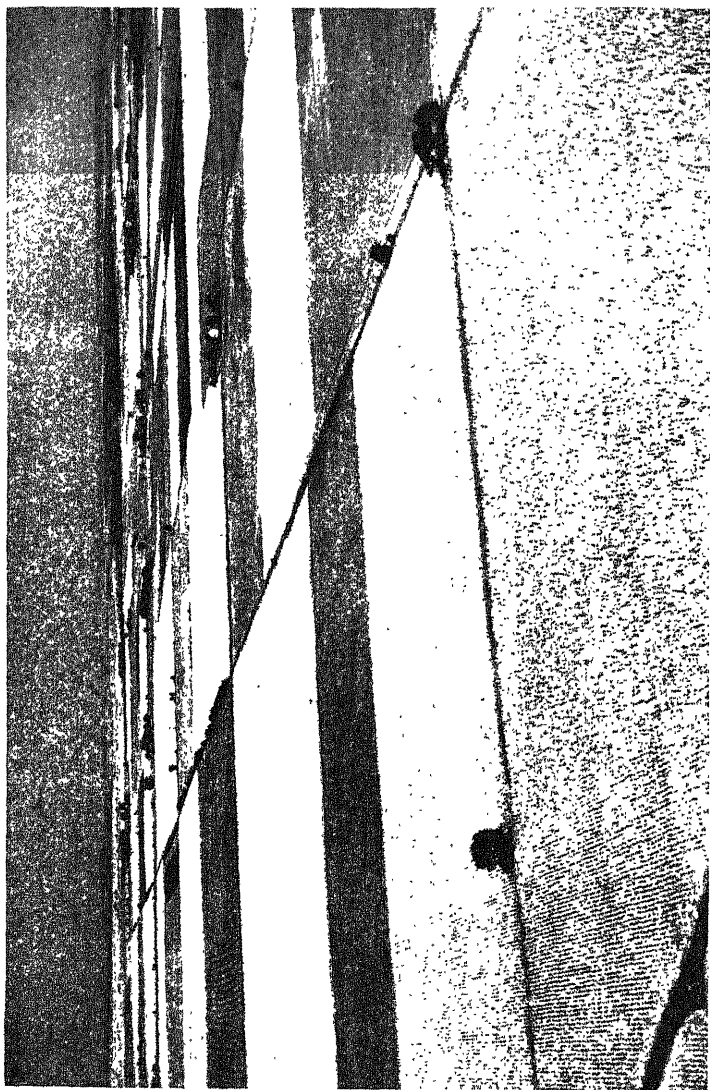
on the lowlands, but in summer they drive their flocks and herds up to the highland pastures near the zone of perpetual snow. Their homes are the light, but substantial *yurts*, tents which consist of thick woollen cloth stretched over a portable framework of trellis. Their only wealth consists of horses, camels, sheep, and goats, which supply nearly all their food, clothing, and utensils. Hides, wool, hair, and articles made from them are exchanged with the neighbouring settled peoples for supplies of grain and metal goods.

In the United States the somewhat similar plateaus of the Rocky Mountain belt are divided into huge open-range ranches, but the grass is so poor that a herd of a thousand cattle requires an area of 50 to 100 square miles. Patagonia is a semi-desert area in the rain shadow of the Andes in South America. It is used chiefly for sheep-rearing.

The *fertile grasslands* of the continental interior have 15 to 25 inches of rain, and are among the most productive regions of the world. The chief areas are: the prairies of North America, the pampas of South America, the steppes of Russia, the veld of South Africa, and the Murray-Darling plains of Australia. In former times most of these grasslands were the home of primitive hunting peoples, e.g. the Red Indians on the prairies, the Bushmen on the veld, and the 'blackfellows' on the Murray-Darling plains. The first use made of them by 'white' men was as vast open-range cattle ranches and sheep-runs. In modern times, however, practically all the good land has been enclosed in farms which are devoted to the cultivation of grain or to the rearing of high quality cattle or sheep.

PRODUCTS OF THE TEMPERATE GRASSLAND

Wheat is the dominant cereal and the chief money crop of all the above-mentioned grasslands, with the exception of the



Mondiale

WHEAT-LANDS IN THE MIDDLE WEST (U.S.A.)

yeld of South Africa. The conditions most suited to the cultivation of wheat are:

1. Fifteen to 25 inches of rain, most of which should fall in the growing season.
2. Warm, sunny, dry weather for ripening.
3. At least one hundred days' growing season between the last frost of spring and the first frost of autumn.
4. Fertile soil, preferably a heavy loam.
5. Level or undulating ground to facilitate farming operations.
6. Easy transport to a good market.

Wheat is widely cultivated in several of the great climatic regions of the world, e.g. the Mediterranean regions, the monsoon lands, and western Europe—but the temperate grasslands provide the bulk of the wheat which enters into world commerce.

Canada is the world's greatest wheat-exporting country. The winters on the prairies are so severe that even if there were time to plough the ground between the harvest and the onset of winter, the frost would kill the seed in the ground. Consequently sowing cannot take place till April or May, and special varieties of wheat are grown which will mature in less than four months. Spring wheat, so called in distinction to the winter wheat grown in Mediterranean, west European, and other regions with mild winters, is grown in all the continental interiors of the northern hemisphere.

In *Argentina* the chief wheat lands stretch in a crescent from Rosario to Bahia Blanca. The mild winters and the nearness of the wheat belt to the sea give the Argentine pampa some advantage over the Canadian prairie as a wheat-growing area, but the industry is not so well organized as in Canada, and the quality is not so uniformly high. Consequently, whereas the wheat export of Canada has greatly

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increased during the present century, that of Argentina has remained almost stationary.

Australia is, next to Canada, the chief wheat-exporting country of the British Empire. The wheat belt stretches in a great crescent from Spencer's Gulf to the southern boundary of Queensland, and includes both 'Mediterranean' and 'Temperate Grasslands' types.

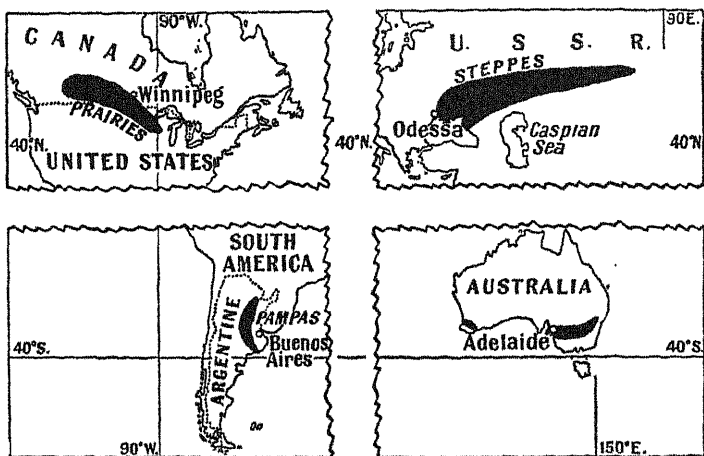


FIG. 40. THE CHIEF WHEAT-LANDS OF THE WORLD

In *Russia* the chief wheat-growing area is the belt of fertile 'black earth' which stretches from Odessa on the Black Sea to Tobolsk in Siberia. Before the Bolshevik Revolution the European part of this region was divided into peasant holdings so small that it was impossible to work the land efficiently. Now, however, each village works the area around it as one large 'collective' farm, and all operations are carried out by the most up-to-date machinery such as is used in Canada and the United States.

The great demand for wheat by the industrial peoples of America and Europe has led to a vast increase in the amount of land devoted to wheat-growing in the 'newer' countries such as Canada and Australia. This increase has been made possible by:

1. The building of railways to facilitate the marketing of the wheat. No matter how fertile the land, it does not pay to grow wheat more than twenty miles from a railway, as transport costs beyond this distance more than counterbalance profits.

2. The breeding of special wheats to suit particular climates. Thus, wheat could not be grown on the prairies of Canada until a variety was found which would ripen in less than four months. In 1912 the Marquis variety, which will ripen in 110 days, was introduced, and was immediately followed by a great expansion of the wheat-growing area. In Australia the introduction of Federation wheat, which has a short straw and consequently requires little moisture, has led to a similar extension of the wheat-growing area into lands formerly considered too dry.

3. Dry farming, by means of which wheat can be grown on land with as little as ten inches of rain per year. In this method the land is left fallow for one year, but is ploughed and harrowed so as to keep most of the moisture in the soil. During the second year wheat is sown, and the rain of that year, together with the moisture left in the soil from the previous year, is generally sufficient for the production of a crop.

4. Vernalization. This is a new method, invented by Russians, of treating seed before sowing so that it comes to maturity very quickly. The seed is soaked in water for several days, and then chilled almost to freezing point. In this way the process normally gone through in the soil before the plant shoots up is carried through before the seed is sown. The Russians claim that by this method it is possible to produce

wheat not only in semi-desert regions but also even in the Tundra region.

Maize. This cereal requires more summer rain and higher summer temperatures than wheat. It is, therefore, the principal grain crop of the warmer parts of the temperate grasslands which receive over forty inches of rain.

In the United States maize is always called 'corn.' The corn belt, which lies south of the spring-wheat belt, is the greatest maize-growing area in the world. The bulk of the crop is used for the fattening of cattle and pigs for the great meat factories of Chicago and other cities. In South Africa 'mealies,' as maize is there called, is the principal cereal, and the chief foodstuffs for both the natives and the farm stock. Another great maize-producing area is the Argentine pampa. Whereas in the United States and South Africa most of the maize is fed to farm stock, that of Argentina is available for export, and that country is, in fact, the world's most important exporter of maize.

Cattle. Among the temperate grasslands, only those which have just been mentioned as notable for maize-growing are of special importance for cattle-rearing. On the South African veld the cattle are reared chiefly as work-animals on the farms, and though there is some beef production the supply is sufficient only for the local markets. The stock-raising and meat-packing industry of the corn belt of the United States has already been mentioned. On the pampas of Argentina and the neighbouring state of Uruguay the raising of beef cattle is one of the principal industries. Here, as in most other 'ranching' areas, the days of the open range and the picturesque cowboys are long past. The ranches are divided into paddocks, special fodder crops are grown for the stock, water pumps are installed to ensure a supply of drinking water, high-priced pedigree stock is imported from Europe,

and no effort is spared to produce beef of the finest quality for the freezing and canning factories. Argentina and Uruguay now supply nearly all the world's chilled beef.

Sheep, when reared specially for their wool, require a rather dry, cool climate without excessive cold. They also

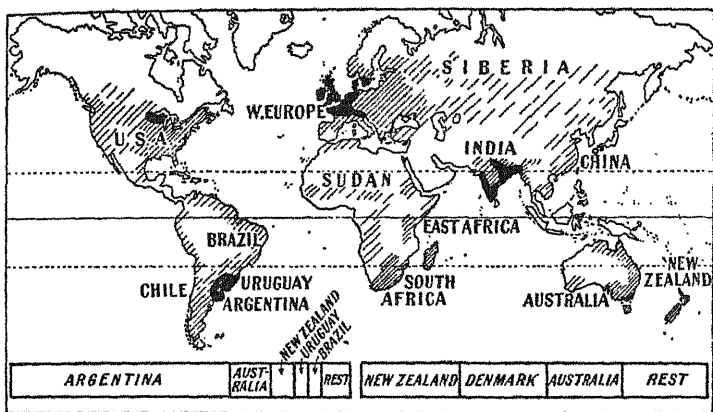


FIG. 41. DISTRIBUTION OF CATTLE

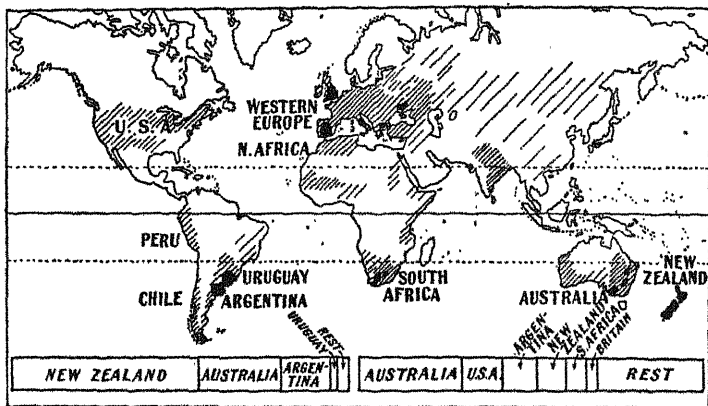
The intensity of shading is roughly proportional to the number of cattle.

thrive well on rather poor grassland; consequently the temperate grasslands of the southern hemisphere are the chief wool-producing regions of the world. Sheep reared for mutton require better pasture and a rather damper climate than those reared specially for wool, but even these do not thrive where the rainfall is more than forty inches per year, unless there are steep slopes with a rapid run-off.

Australia, with a flock of 112 million, is the world's chief sheep-rearing country. Most of the sheep are reared on the temperate grasslands which have between 10 inches and 30 inches of rain. Where the rainfall is between 20 and 30 inches

one sheep requires about an acre of ground, in areas with a rainfall of 10 inches one sheep requires about four acres, and on land with only 5 to 10 inches of rain, only a few sheep per square mile can be kept.

Russia, with a flock of 66 million, is the second most important sheep-rearing country, but the number of sheep per square mile is rather low, even in the best sheep areas, which lie between the Caspian Sea and the Black Sea. The



Britain's imports of frozen mutton and lamb.

World production of wool.

FIG. 42. DISTRIBUTION OF SHEEP

United States is third in order of total number of sheep, but here again the number is not great in proportion to the total area. *Argentina* has 44 million sheep, those on the moister lands near the Plata estuary being reared principally for mutton, while those on the drier lands of the interior are bred chiefly for wool. *Uruguay* also exports large quantities of both wool and mutton. *New Zealand* is, in proportion to her size and population, the chief sheep-rearing country in the world. The speciality is in the production of frozen lamb, but some wool-sheep are also reared. *South Africa* is now one

of the world's chief sources of wool, the sheep being kept principally on the high plateau of the veld, where the rainfall is from 15 inches to 30 inches per year.

Great Britain is, next to New Zealand, the leading sheep-rearing country of the world, in proportion to her size. The specialization is in the production of mutton and lamb.

II. THE MEDITERRANEAN REGIONS (See fig. 43, p. 84)

The areas which have a Mediterranean type of climate (see p. 36) are all situated on the western sides of the continents, between latitudes 30° and 40° . They are: (1) The real Mediterranean region of southern Europe and north-west Africa. (2) The tip of South Africa, around Capetown. (3) The state of California in North America. (4) The middle part of Chile in South America. (5) The south-western and the south-eastern corners of Australia. The North Island of New Zealand is sometimes included with the Mediterranean regions, but differs from them in having rain in summer as well as in winter.

In the Mediterranean regions the mild, sunny, and showery winter is the best season for plant growth, and so most of the trees and bushes are evergreens. The summers, however, are so hot and dry that only those trees and plants survive which have some means of withstanding the drought, e.g. leaves covered with hairs or a glossy 'varnish' to reduce the loss of moisture; branches which keep close to the ground and so escape in part the hot, dry winds; long roots which penetrate deep into the ground in search of the moisture in the sub-soil. On dry, stony hill-sides the characteristic vegetation is the 'maquis'—a dense mass of low shrubs and sweet-smelling perennial herbs such as broom, heather, myrtle, and lavender.

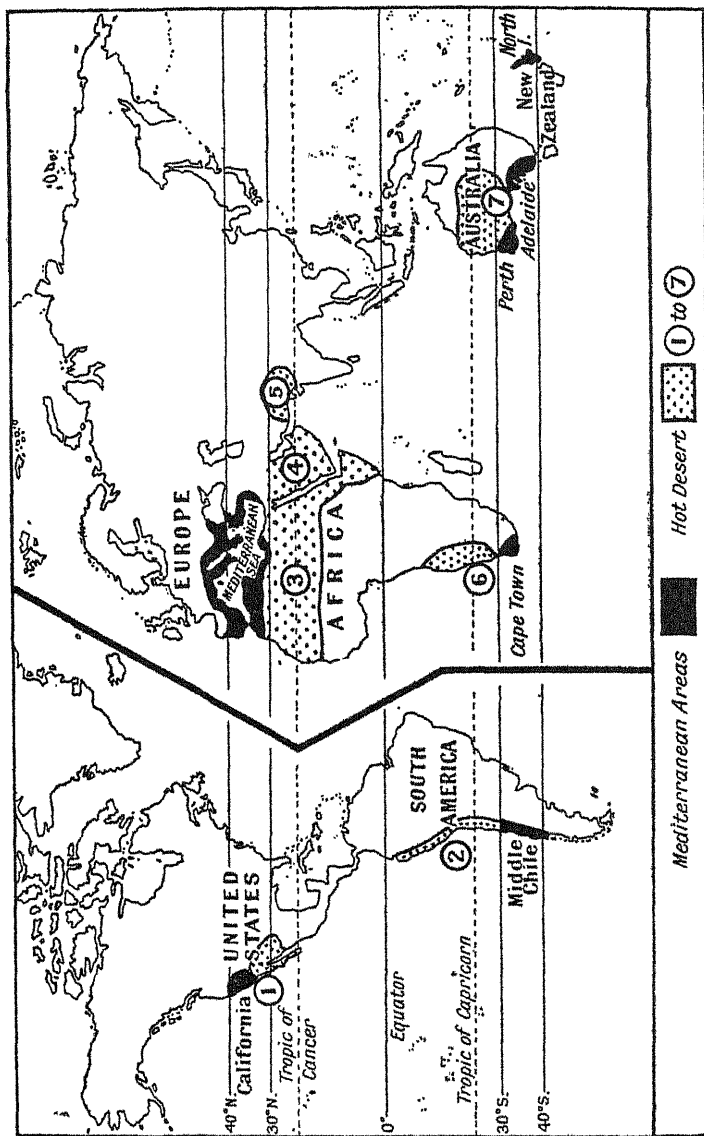


FIG. 43. MEDITERRANEAN AREAS, WITH REVISION OF THE HOT DESERTS

For the farmer, also, the hot, dry 'Mediterranean' summer creates a difficult problem, but by careful selection of crops to suit the season, and by skilful conservation of every drop of moisture, he is able to produce crops throughout the year.

Wheat is the principal cereal in all the Mediterranean areas; it is sown during the mild, moist winter, and harvested early in the hot, dry summer. In Europe the most important 'Mediterranean' wheat-producing countries are Italy and Spain, but in neither case is there a surplus for export. The wheat of California and South Africa is also used within the home country, and Middle Chile has only a comparatively small surplus. In the Mediterranean regions of Australia, however, over two-thirds of the cultivated land is devoted to wheat, and, as the population is small, great quantities of grain are available for export.

Fruit and vegetables are widely grown in the Mediterranean areas, especially where there is abundant water for irrigation. In California fruit-growing and market gardening have been developed to an unequalled extent, and vast quantities of fresh, dried, and canned products are exported. In eastern Spain, southern Italy, and Palestine oranges are the chief 'money' crop.

Grapes are typical of Mediterranean areas, though they also grow well in the warmer parts of western Europe. The chief wine-producing countries are France, Italy, Spain, and Algeria. Table grapes are grown chiefly in California and south-eastern Spain, raisins in California, southern Spain, and Asia Minor, and currants in Greece.

Olives will grow only in Mediterranean regions, and are almost restricted to the countries on the borders of the Mediterranean Sea, where the unrefined oil is used in place of butter. Spain and Italy supply roughly a half and a quarter respectively of the world's olive oil.

Cattle are not very numerous in Mediterranean areas, as the

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hot, dry summers do not favour the growth of meadow grass. *Sheep* and *goats* are, therefore, the chief domestic animals, the former being driven to the mountain pastures in summer and back to the lowlands in winter.

III. WEST EUROPEAN TYPE

As we have seen, the areas with this type of climate are those situated on the western sides of continents between latitudes 40° and 60° . The distinguishing features of our climate are the mildness of the winters, the even distribution of the rainfall throughout the year, and the lack of extremes of either temperature or rainfall, combined with great variability from day to day. In spite of all its drawbacks our climate is one of the best in the world. It is claimed that an average outdoor temperature of 40° F. is most suitable for mental activity, while 55° F. to 70° F. is most conducive to physical activity. As these are approximately the average winter and summer temperatures of north-western Europe, it would seem that our climate helps to account for the fact that our continent is the centre of modern civilization.

Other areas with a west European type of climate are: British Columbia and the neighbouring states of Washington and Oregon; southern Chile; Tasmania; and the South Island of New Zealand. All these are mountainous areas, and the area of mild, moist climate is restricted to comparatively narrow strips without sufficient lowland to form 'cradles of civilization' comparable to that of western Europe.

The natural vegetation of all west European areas is deciduous forest, with coniferous woodland in the colder areas and heath and moor on the bleak hill-tops. In western Europe nearly all the forest has been cleared, and, though in the other areas there is much virgin forest, only British Columbia has a great lumbering industry.

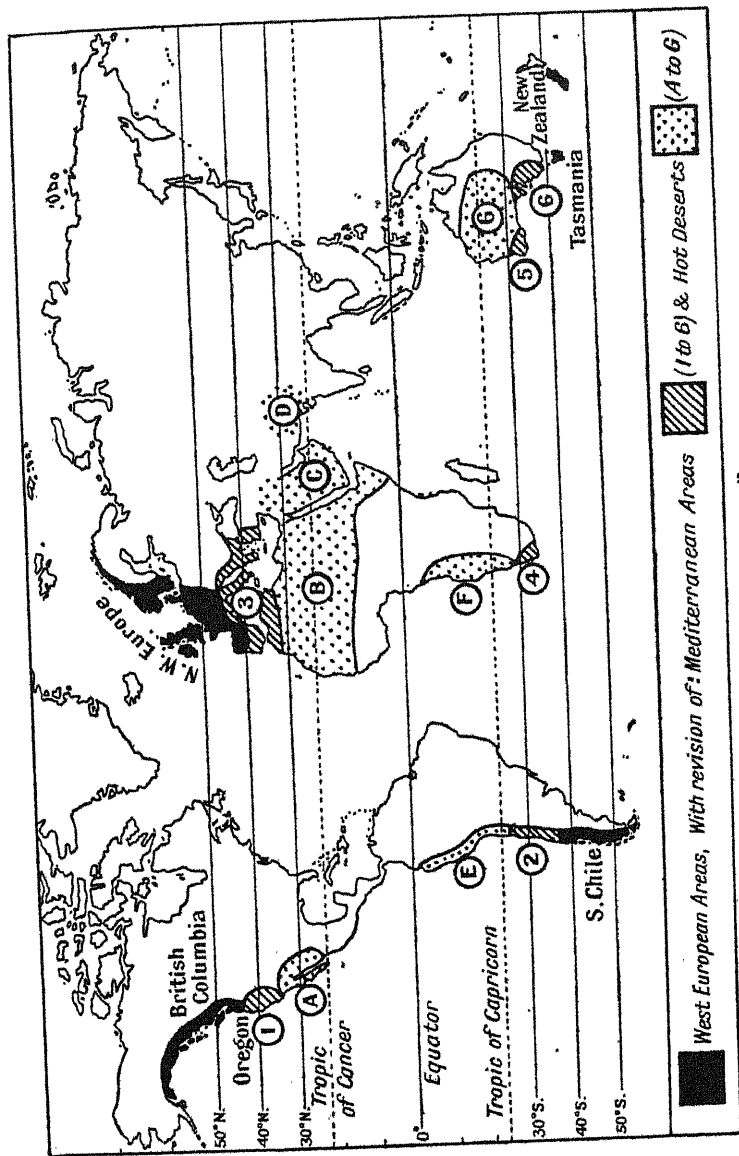


FIG. 44. WEST COAST CLIMATE

FARMING IN WEST EUROPEAN REGIONS

Britain. Though Britain is pre-eminently a manufacturing country, farming is still our greatest single industry, and about one-tenth of our people are directly dependent on the land for a livelihood.

The farm land of Britain and of most European countries may be classified as follows:

(1) Arable land; (2) permanent grassland; (3) rough grazing land.

The arable land is always worked on a rotation system, the commonest type being the Norfolk system in which wheat is grown the first year, turnips or potatoes the second year, barley the third year, and beans, clover, or other 'sown' grasses the fourth year. The farmer, of course, arranges the system so that different fields are producing different crops in any particular year, thus giving him at least four crops, and often, by substituting on part of his land peas for beans, and potatoes, sugar-beet, or cabbages for the roots, he may produce seven or eight main crops. Under the heading of arable land we may also include market gardens and allotments.

The permanent grassland is of two types: pasture and meadow, the latter being kept free from grazing animals during spring and summer in order that it may produce a good crop of hay. (Note that the 'rotation' system gives us a third type of grassland—that which is occupied for one, or in some areas two, or three years, by 'sown' grasses.)

Rough grazing land includes heath, moorland, commons, and poor marshy land which provide food for small numbers of sheep, or summer pasture for cattle.

The distribution of the above types of land in our country is determined by the character of the soil, the climate, the elevation of the land, and its degree of accessibility. The

British farmer distinguishes the following main types of soil: (1) *Clay soils*, which have the advantages of holding water well and of containing much plant food but the disadvantages of being unworkable in very wet weather and taking a long time to 'warm up' in spring. (2) *Loams*, which are soils containing about 10 to 15 per cent of clay, the rest being composed of sandy matter and humus (the product formed by the decay of vegetation). Rich loams are the finest types of agricultural soil, being suitable for almost any crop. (3) *Sandy soils*, which are easily worked at any time and warm up quickly in spring so that they produce early crops. Though they are naturally infertile, they may be rendered productive by the liberal addition of manures. They are, therefore, often used for market gardens, as the value of the products makes it economical to spend money on fertilizers.

Though there are some parts of our country where the farmers devote almost all their attention to one special branch of farming—e.g. sheep-rearing on the Welsh hills, the fattening of beef cattle around Melton Mowbray, and the growing of fruit and hops in eastern Kent—yet the vast majority of our farms are of the 'mixed' type, with some pasture land, some meadow land and some arable. Even on the Welsh sheep farms there is usually a small area of arable land and a meadow or two to provide hay for a few cows; a typical Cheshire dairy farm has about a quarter of its area under plough, and produces such crops as oats, roots, and clover; and the Fenland farm which specializes in the production of wheat also produces oats, barley, sugar-beet, root crops, etc.

Specialization in particular branches of farming is determined by such factors as the elevation of the land, the amount of the rainfall, the quality of the soil, and the accessibility to markets. *Sheep* require dry land, and will thrive on rather poor grass; they are, therefore, found chiefly on the escarp-

ments of south-eastern England which are dry, since they are composed of chalk and limestone, and on the hill-sides in Wales the Lake District, and southern Scotland, where, though the rainfall is heavy, the slopes are so steep that the water runs

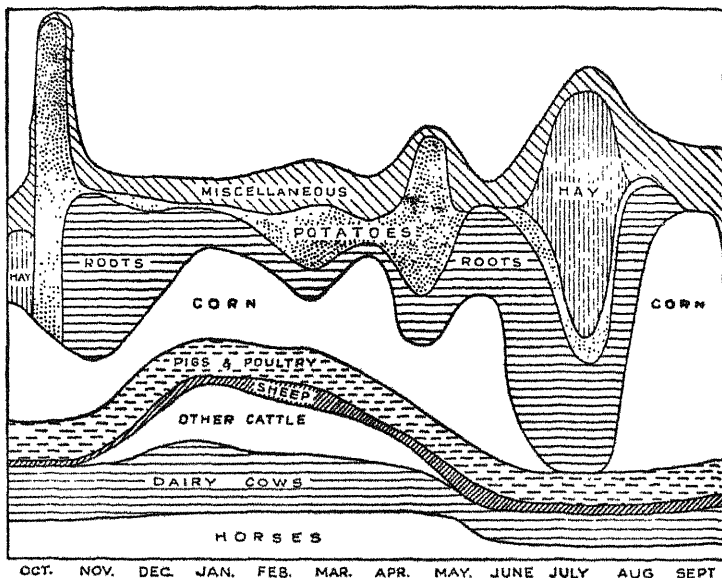


FIG. 45. LABOUR DISTRIBUTION THROUGHOUT THE YEAR ON A TYPICAL FARM IN THE ENGLISH MIDLANDS

Reproduced, with permission, from Watson and More's *Agriculture* (Oliver and Boyd).

off immediately. *Cattle* do best on moist lowlands, and are therefore most numerous on the western lowlands of the British Isles—the Irish Plain, the south-western peninsula of England, the Lancashire and Cheshire Plain, and the lowlands of south-western Scotland. Cattle farmers who are

within, say, 50 miles of large centres of population generally find it most profitable to specialize in the production of fresh milk for sale in the towns, while those who are remote from such markets specialize in the production of butter and cheese, or in the rearing of stock. London, however, draws its daily supplies of fresh milk from districts as far afield as Somerset and the Vale of Eden. *Wheat* is grown principally in the east of England where the rainfall is rather low (under 25 inches per year) and the summers are warm and sunny. *Oats* will do well under varied conditions and are, therefore, an important cereal on all the fertile lowlands of the country, though in the east they share the land with wheat, while in the west they are almost the only cereal.

The Midlands of England are the most typical of English farm lands, since they are situated between the warmer south and the cooler north, and between the wetter west and the drier east. Fig. 45, which shows the labour expended on the various branches of farming in each month of the year, emphasizes not only the variety of the produce and the fairly even distribution of the total labour throughout the year, but also the great variety of work that the farmer and farm labourer have to do. Farming is, indeed, one of the most highly skilled occupations, and the farm labourer must be an expert in a great number of different jobs.

Peasant Farming in Europe. A 'peasant' is a countryman who cultivates *by his own labour* a small plot of ground which he owns or rents. The term is, however, usually applied only to the small-scale farmers of western, central, and southern Europe where a large percentage of the people are engaged principally in the production of crops for their own needs or for the local markets.

The life and work of the farmers in the different countries of Europe vary greatly in accordance with differences of

climate, soil, and elevation, but the peasants are everywhere characterized by their intense love of the soil, by their tendency to cling to old methods and customs, and by their willingness to work long hours for small returns. Where peasant-ownership of the land is the rule, as in France, the holdings frequently consist of several small scattered plots, and a man may have to walk a mile or so from his wheat field to his meadow, another half-mile to his potato patch, and so on. This wastes a good deal of time and prevents the use of modern agricultural machinery, so in many places efforts are being made to regroup the fields, either by mutual agreement or by the decree of the Government.

In parts of Italy and other Mediterranean countries the peasants are so poor that they can neither buy land nor pay a money-rent for it; in such areas the land-owner purchases the seeds, manures, and even agricultural implements, in return for which the peasant 'pays' an agreed share of the crop—usually half. This system is known as *métayage* in Europe, while in the cotton belt of the United States, it is known as 'share-cropping.' One great disadvantage of the system is that the peasant has no real 'security of tenure'—that is, he cannot be sure that he will be able to retain the same land from year to year—and in consequence it is difficult for him to be keenly interested in maintaining the fertility of any particular plot.

In Germany, though there are many large estates on which the work is done by hired labour, the bulk of the land is owned by peasants, and roughly half the agricultural land is in small farms of less than 12 acres. The Nazi leaders of modern Germany consider that a peasantry 'rooted to the soil' is one of the fundamental necessities of the State, and laws have been passed ensuring that all those peasants who are of 'good German stock,' and who obey the numerous regulations of the

Government, are guaranteed possession of their land for themselves and their male heirs for ever. In return for this safeguard it is the duty of the peasants to produce the crops demanded by the Government, even in cases where these are not the crops which would bring them most money.

Intensive Commercial Farming. In most of the countries of western Europe the farmers depend largely on the money they get by the sale of their produce, but there are certain areas where the farmers devote almost all their energies to the production of 'money crops' for the world's markets. Examples of such highly commercialized types of farming are dairying in Denmark, horticulture in Holland, and orange-growing in Spain.

Farming in other West European Areas. In British Columbia, Washington, and Oregon the chief specialization is in the production of 'deciduous' fruits—apples, pears, plums, peaches, etc. Tasmania also specializes in the production of apples for the European markets. South Chile differs from all the other 'West European' areas in being almost unpeopled, and in having hardly any areas cleared for farming. The South Island of New Zealand is notable chiefly for sheep-rearing and for the production of 'Canterbury' lamb.

IV. THE EASTERN MARGINS IN THE TEMPERATE ZONE

I. THE SUB-TROPICAL AND WARM-TEMPERATE EASTERN MARGINS

These include (1) The temperate monsoon region of China and Japan. (2) South-eastern United States. (3) The pampas region of South America. (4) Natal. (5) The south-eastern coast-lands of Australia. Here, as in the tropical

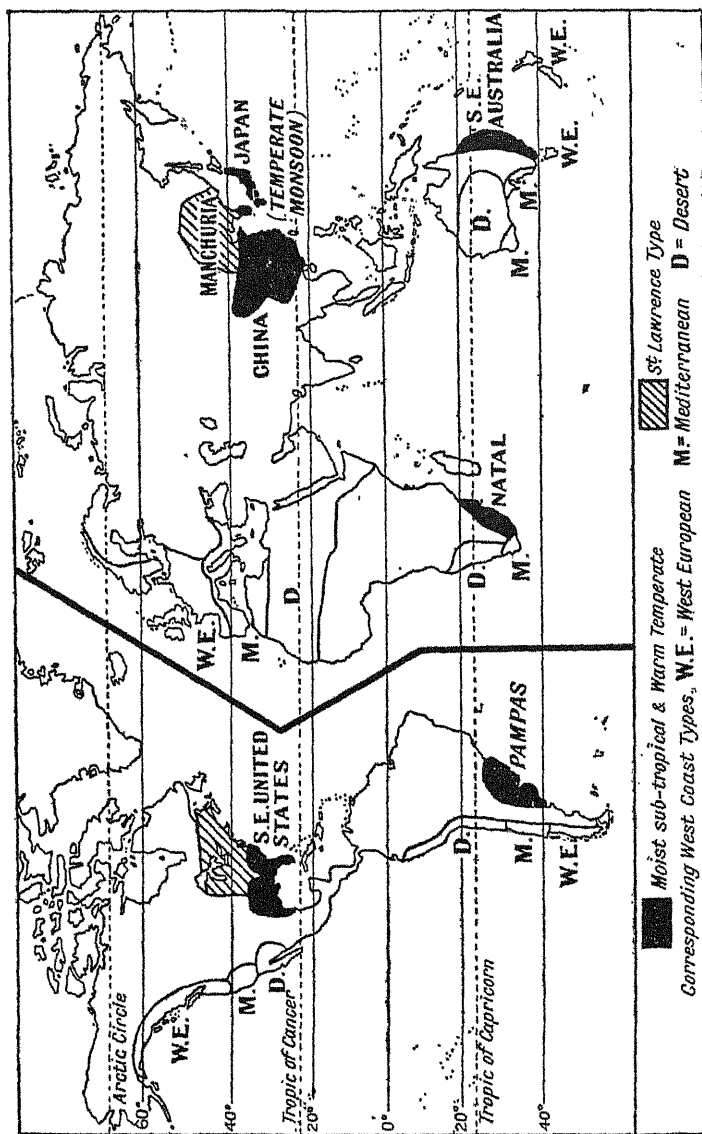


FIG. 46. EAST COAST CLIMATES, WITH REVISION OF WEST EUROPEAN, MEDITERRANEAN, AND DESERT AREAS

coast-lands, the rain falls chiefly in summer, but it is due not so much to the trades as to the winds drawn in to the heated interior. Consequently all these areas have partial monsoon characteristics, though it is only in the largest continent,

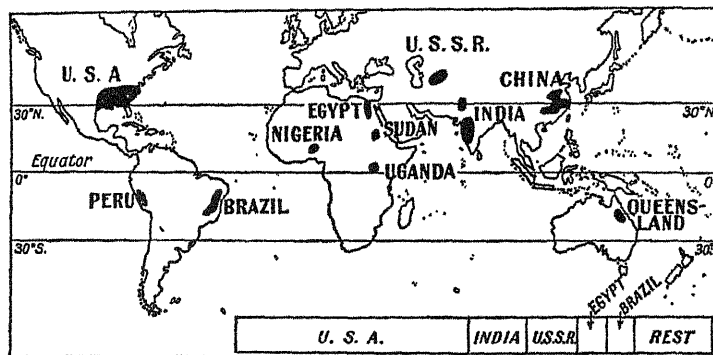


FIG. 47. PRODUCTION OF COTTON

Asia, that the differences of temperature between land and sea are so great as to cause true monsoons.

Cotton is the most typical product of the sub-tropical east coasts, though it is also grown in the Sudan regions, and, by irrigation, in the hot deserts.

The conditions most favourable for the successful cultivation of cotton are:

1. A frost-free period of seven months.
2. Over 25 inches of rainfall.
3. Mild, showery weather in spring.
4. Hot summers, with long spells of bright sunshine interspersed with thunder showers.
5. A long, cool, dry autumn for ripening and harvesting.

South-eastern United States is the world's chief cotton-

growing area. In spite of a decline in recent years it still produces about 40 per cent of the world's supply.

India, the second largest producer, supplies much of the lower quality, short-staple cotton for the world's markets, as well as some long-staple American cotton. China, the next most important producer, has little surplus for export, while Russia uses all her production in her own factories. Egypt specializes in the production for export of high quality, long-staple cotton. Other important sources of supply are Brazil, Peru, British East Africa, and the Sudan.

2. THE COOL-TEMPERATE EASTERN MARGINS (THE ST LAWRENCE TYPE)

These regions lie in the same latitude as the west European regions, but as the prevailing westerly winds blow from the interiors of the continents, they have cold winters. The summers are slightly warmer than in corresponding latitudes on the western sides of the continents, but the precipitation (snow in winter) is well distributed throughout the year. The regions with this type of climate are eastern Canada, with the neighbouring part of the United States, and Manchuria.

V. THE CONIFEROUS FOREST BELT

Northward of latitude 50° the temperate grassland merges into the coniferous forests which stretch as an almost continuous belt across Canada, Asia, and northern Europe.

Climatically the coniferous forest area is characterized by long, intensely cold winters and by short, warm summers. In winter there is much snow, and in summer frequent showers of rain, but the total precipitation (reckoning a foot of snow as the equivalent of an inch of rain) does not average more than 10 or 15 inches.

The coniferous forest area is the world's chief source of the 'soft woods'—pine, spruce, and larch—which are used for most constructional purposes and for the manufacture of wood pulp which is the raw material for the paper and artificial silk industries. Lumbering operations are carried on in winter, the logs being hauled across the frozen snow to the rivers down which they are floated after the summer thaw.

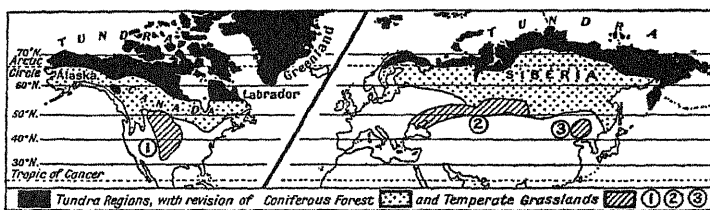


FIG. 48. TUNDRA, CONIFEROUS FOREST, AND TEMPERATE GRASSLANDS

The chief sources of the world's soft woods are Finland (20 per cent of the world's exports), Russia (19 per cent), Canada (18 per cent), Sweden (16 per cent), U.S.A. (10 per cent).

Other great resources of the coniferous forest belt are furs, water-power, and minerals. In Canada the trapping of fur-bearing animals—musk-rat, beaver, fox, and mink—is chiefly in the hands of Indians and half-breeds, who spend the long winter visiting traps which they set at intervals over a distance of 50 or 100 miles. The bulk of the fur used commercially in the world comes from three primary sources—Canada, Russia, and the United States.

Water-power, which is used in the form of hydro-electricity, is abundant in the forest regions of Canada, Scandinavia, and Finland. The hydro-electricity generated at the numerous plants on the rivers is not only used for running the saw-mills, pulp-mills, and paper-mills, but is also transmitted over

long distances to the towns in the more densely peopled districts to the south.

A large part of the coniferous forest belt is underlain by hard old rocks which yield many minerals. In Canada fields of mineral wealth have been discovered in almost every area which has been carefully prospected. It is fortunate that the minerals are such valuable metals as gold, silver, zinc, copper, and nickel, which will pay for the cost of transport over long distances.

Farming is of little importance in the coniferous forest belt as, even when the timber has been cleared, the soil is generally thin and infertile. Even in those few areas where there is a considerable depth of good soil, the long, cold winters are a great drawback, though the effect is in part offset by the great length of the summer day which causes crops to mature quickly.

THE TUNDRA

This is the region near the Arctic shores of North America and Asia where the winters are so long and severe as to prevent the growth of trees. The only vegetation is dwarf shrubs, Arctic mosses, and, during the brief summer, short-lived flowering plants.

The region is, therefore, a cold desert, and as in other deserts the inhabitants have to adopt a nomadic mode of life. The Eskimos live on the coasts of Greenland, Newfoundland, and northern Canada. In winter they live in snow igloos and spend most of their time sealing on the ice; in spring they migrate southward to hunt the caribou, an animal very similar to the reindeer; and in summer they return to the coast to fish and hunt seals. This traditional mode of life, however, is being abandoned by many of the Eskimos who have learnt to fish for cod and to trap fur-bearing animals for sale to the

CLIMATIC STATISTICS OF STATIONS TYPICAL OF THE MAJOR NATURAL REGIONS

| Natural Region | Station | Altitude (feet) | Temperature (° F.) | | | | | | | | | | | | Rainfall (inches) | | | | | | | | | | | | Year | |
|--------------------------------------|--------------------|-----------------|--------------------|----|----|----|----|----|-----|----|----|----|----|----|-------------------|----|----|----|----|----|-----|----|----|----|----|----|------|-----|
| | | | J. | F. | M. | A. | M. | J. | Jy. | A. | S. | O. | N. | D. | J. | F. | M. | A. | M. | J. | Jy. | A. | S. | O. | N. | D. | | |
| I. West European | London | 18 | 39 | 40 | 43 | 47 | 53 | 59 | 63 | 62 | 57 | 49 | 44 | 39 | 18 | 17 | 17 | 17 | 18 | 23 | 26 | 24 | 20 | 27 | 23 | 21 | 251 | |
| II. Mediterranean | Naples | 492 | 47 | 48 | 53 | 57 | 64 | 70 | 75 | 75 | 70 | 63 | 55 | 49 | 35 | 28 | 29 | 26 | 20 | 13 | 06 | 11 | 28 | 44 | 45 | 43 | 328 | |
| III. Hot Desert | Cairo | 98 | 54 | 57 | 62 | 70 | 77 | 82 | 83 | 82 | 78 | 75 | 66 | 59 | 03 | 02 | 02 | 02 | 0 | 0 | 0 | 0 | 0 | 01 | 01 | 03 | 14 | |
| IV. Sudan | Mongalia | 1440 | 82 | 80 | 78 | 79 | 79 | 78 | 76 | 76 | 80 | 79 | 81 | 81 | 02 | 08 | 16 | 40 | 52 | 43 | 47 | 63 | 35 | 48 | 20 | 03 | 377 | |
| V. Equatorial | Para | 144 | 78 | 77 | 78 | 78 | 79 | 79 | 78 | 79 | 79 | 79 | 80 | 79 | 12 | 14 | 14 | 12 | 10 | 6 | 6 | 5 | 4 | 3 | 2 | 6 | 96 | |
| VI. Tropical Monsoon | Rangoon | 18 | 77 | 79 | 84 | 87 | 84 | 81 | 80 | 80 | 81 | 82 | 80 | 81 | 02 | 02 | 03 | 14 | 12 | 18 | 21 | 19 | 15 | 4 | 73 | 28 | 03 | 996 |
| VII. Tropical Eastern Margins | Mozambique | 13 | 82 | 82 | 83 | 81 | 78 | 74 | 74 | 75 | 77 | 80 | 83 | 83 | 8 | 9 | 7 | 4 | 2 | 1 | 05 | 13 | 05 | 01 | 03 | 49 | 393 | |
| VIII. Warm-temperate Eastern Margins | Sydney | 146 | 72 | 71 | 69 | 65 | 59 | 54 | 52 | 55 | 59 | 63 | 67 | 79 | 37 | 47 | 51 | 52 | 49 | 52 | 47 | 33 | 29 | 28 | 29 | 26 | 480 | |
| IX. Cool-temperate Eastern Margins | Boston (U.S.A.) | 125 | 27 | 28 | 35 | 45 | 57 | 68 | 72 | 69 | 63 | 52 | 41 | 32 | 37 | 35 | 41 | 38 | 37 | 31 | 35 | 42 | 34 | 37 | 41 | 38 | 446 | |
| X. Temperate Grass-lands | Bourke (Australia) | 460 | 84 | 82 | 77 | 68 | 58 | 54 | 51 | 56 | 63 | 70 | 76 | 82 | 20 | 19 | 16 | 14 | 11 | 10 | 09 | 09 | 10 | 11 | 13 | 11 | 152 | |
| XI. Temperate Deserts Plateaus, etc. | Kashgar | 4225 | 22 | 34 | 47 | 61 | 70 | 77 | 80 | 76 | 69 | 56 | 40 | 26 | 03 | — | 02 | 02 | 08 | 04 | 03 | 07 | 03 | — | — | — | 02 | 35 |
| XII. Temperate Forest | Barnaul (Siberia) | 531 | -4 | 0 | 12 | 33 | 52 | 62 | 68 | 62 | 50 | 35 | 15 | 5 | 08 | 05 | 05 | 06 | 13 | 17 | 22 | 18 | 12 | 13 | 11 | 10 | 140 | |
| XIII. Tundra | Spitzbergen | 37 | 4 | -2 | -2 | 8 | 23 | 35 | 42 | 40 | 32 | 22 | 11 | 6 | 14 | 13 | 11 | 09 | 05 | 04 | 06 | 09 | 10 | 12 | 10 | 15 | 118 | |

white traders. The Governments of Canada and Alaska have also introduced tame reindeer to provide the Eskimos with an alternative means of subsistence.

The Lapps live in the extreme north of Scandinavia and Finland. Like the Eskimos they are nomads, but they depend on their herds of reindeer instead of on hunting and fishing.

CHAPTER V

NATURE—BUILDER AND SCULPTOR

THE sun is in a sense the parent of us all, for without its heat and light there would be no life. The sun is even the parent of the earth itself, for countless aeons ago the matter of which the earth is composed was thrown off from the sun as a dense cloud of particles and these particles were drawn together eventually to form our globe.

It is a matter of common observation that the surface of the earth is composed of rocks and the soil derived from these rocks; but what lies underneath the crust? The deepest mines are mere scratches on the surface of the earth. Indeed, if we represented the earth by a circle of 4-inch radius the deepest mine would be shown by a line $1/2,000$ th of an inch long, i.e. it would not penetrate the line bounding the circle. Yet by amazingly clever experiments and observations men have investigated the composition of the interior of the earth. The outer crust, which is composed of rocks similar to those of the surface, is at the most 600 or 700 miles thick. It is now thought that the continents are composed of lighter rocks, 'floating' on the heavier rocks of the crust (see Fig. 49). Under the crust is a heavy core believed to consist of iron with a mixture of nickel and other metals.

We know that as we go down a mine the temperature increases roughly 1° F. for every sixty feet; at a depth of 1,000 miles, therefore, the temperature would be about $90,000^{\circ}$ F.—so hot that every known substance would melt. On the other hand, the pressure is so great that nothing *can*

melt. It seems, therefore, that this heavy core of the earth consists of something which is neither liquid nor solid. It has indeed been described as 'more fluid than water and more rigid than steel.' Certainly, as soon as the pressure is reduced through the formation of a crack on the surface or by other means, the underlying rock becomes liquid, and may rise to

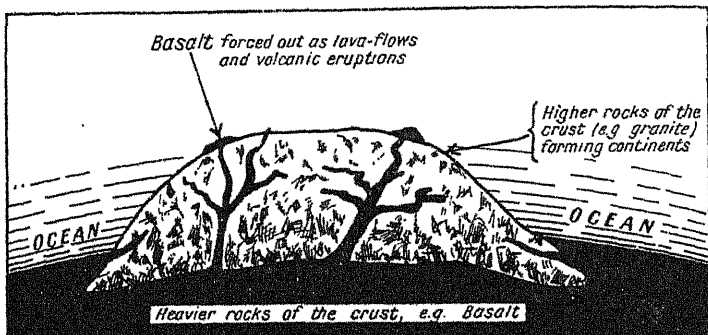


FIG. 49. STRUCTURAL DIAGRAM OF THE EARTH'S CRUST

the surface to form a volcano, or may merely force its way into layers of rock near the surface, there cooling and forming solid rock. Certain lines of weakness on the earth's crust are characterized by frequent earthquakes and volcanic eruptions. One such line of weakness is the Pacific 'Ring of Fire' which runs through the island arcs of east Asia, then through the Rockies and the Andes, and through New Zealand to the East Indies. Other similar lines of weakness run through the Mediterranean and the West Indies (see Fig. 50).

THE CHANGEFUL FACE OF THE EARTH

The Psalmist speaks of the 'Everlasting hills,' but geology teaches us that neither hills nor mountains, nor any other

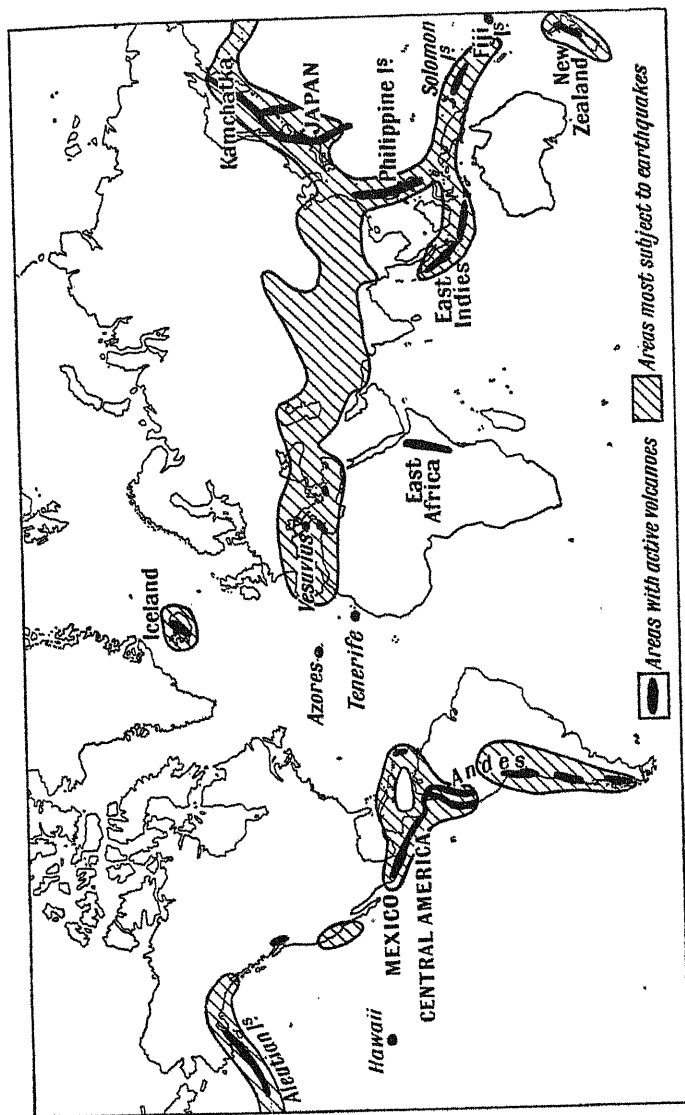


FIG. 50. AREAS SUBJECT TO EARTHQUAKES AND VOLCANOES

parts of the earth's surface, are permanent features of the landscape. Nature builds and destroys these features, though so slowly that we cannot see any difference in a lifetime: 'A thousand ages in His sight are as an evening gone,' and we must think, not in terms of years, but in millions of years.

By the study of rocks and fossils geologists have learned

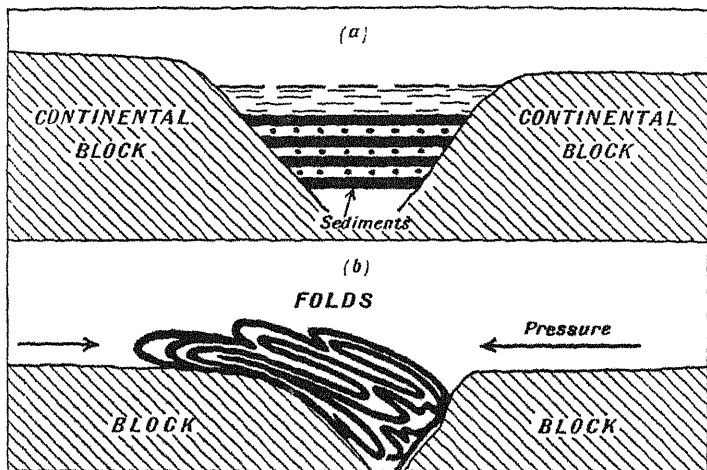


FIG. 51. THE FORMATION OF FOLD MOUNTAINS

what the surface of the earth was like in periods long past. If a series of models of a part of the earth's crust were made to represent intervals of a thousand years, and photographs were taken of these models and put together in the form of a cinema film, we should see the outline of the land continuously changing, mountain ranges heaved up and worn away, seas filled up and replaced by plains and mountains. As Tennyson wrote: 'The hills are shadows, and they flow from form to form and nothing stands.'

Even the continents have changed throughout the ages,

and many geologists think that they were formerly all grouped together in one great land mass in the southern hemisphere. Then this continental mass broke up and parts of it drifted away to their present positions. Whether or not this theory of 'continental drift' is true, the similarity of rocks, minerals, plants, and animals in the three southern continents show that they were at one time joined together.

HOW MOUNTAINS ARE FORMED

Nearly all the great mountain ranges of the world are fold mountains, i.e. they were formed by the folding of the rocks of the earth's crust. Fig. 51 represents this process diagrammatically. The layers of rocks were nipped between ancient blocks of the earth's crust and thrown into folds

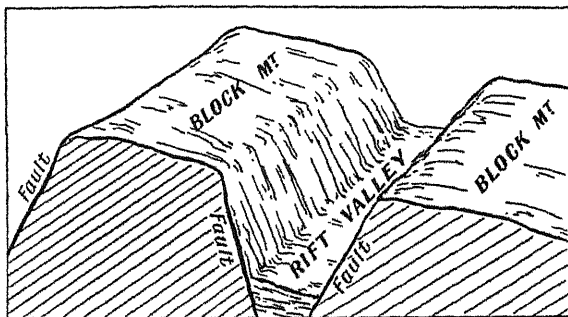


FIG. 52. DIAGRAM OF BLOCK FORMATION

which are usually of great complexity. The Alps, the Rockies, the Andes, the Himalayas, and other great mountain ranges, were all formed by such folding.

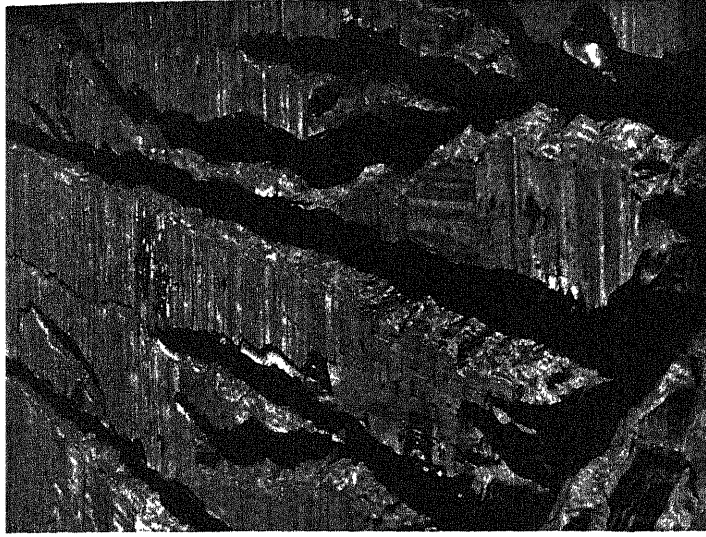
Other mountains are of the block type, i.e. they were formed by being pushed up between parallel faults or by the sinking of the land around them (see Fig. 52). Examples of such block mountains are the Bohemian block in central

Europe, and certain parts of the Rocky Mountain system. Rift valleys are formed by the sinking of the land between the parallel faults or by the land on each side being pushed up (see Fig. 52). Examples of such rift valleys are the Central Plain of Scotland, the Rift Valley between the Black Forest and the Vosges, and the East African Valley, which is continued through the Red Sea to the Dead Sea and the Jordan Valley.

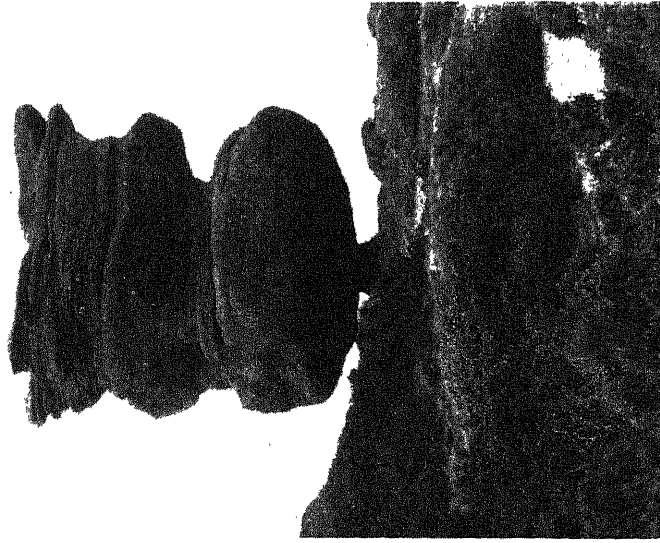
NATURE'S MODELLING TOOLS

Wind, water, ice, frost, and snow all take part in the modelling of the land surface. Frost is the chief agency in the breaking up of rocks. As water cools it contracts until it reaches 4°C. , then as it cools further it expands. On high mountains this expansion exerts such force that pieces are split off the rocks and slide down the mountain-side to accumulate as *screes*. The jagged peaks of snow-capped mountains, such as the Alps and Himalayas, owe their formation to this chiselling by frost. In mild climates the rocks are gradually worn away into small particles of sand and gravel.

Wind is not in itself capable of wearing away rock, but when armed with fine particles of sand it acts as a sand blast which is capable of wearing away soft particles of rock. Such rocks as the Idol Rock (opposite) owe their origin to the action of the wind, and in deserts rock faces are often etched by the wind so that in the distance they appear as walls of castles or temples. The wind is, however, far more important as the agent of transportation than of denudation. The sand storms of the desert sweep the sand away from the higher parts, and deposit it in the lower areas, thus forming the 'seas of sand' characteristic of certain parts of the Sahara. The dust storms of North America carry away vast quantities of good topsoil every year, thus exposing the lower layers to



Count Castil
 EROSION IN THE LOESS, CHINA. THE BRANCHING
 GULLIES ARE 150 TO 300 FEET DEEP



Will F. Taylor
 THE EFFECTS OF WIND EROSION AT BRIMHAM ROCKS,
 YORKSHIRE

further erosion and spoiling millions of acres of farm land. In past ages dust storms blowing out from the centre of the continents have built up great masses of the porous soil known as loess. The chief areas in which loess deposits are to be found are China, south-east Russia, and the eastern side of the Mississippi in North America.

Streams, especially when they flow rapidly and are armed with much sediment, play a great part in the modelling of the

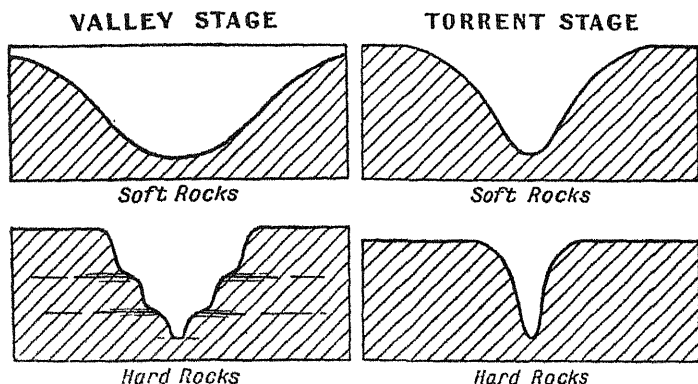


FIG. 53. PROFILE SECTIONS OF VALLEY STAGE AND TORRENT STAGE
IN HARD AND SOFT ROCKS

land surface. The valleys they have carved out vary considerably in accordance with the type of rock, the power of the stream and the climate. Where the rock is soft, that is, easily worn away, the valleys are broad and with gently sloping sides (as in Fig. 53), but where the rocks are hard and the climate is dry, so that there is very little downwash, the sides are steep and even precipitous, as in the Great Canyon of North America.

The course of a typical river may be divided into three parts: (1) *The Torrent Stage*, in which the stream flows swiftly

in a narrow valley, and carries along with it large boulders and great masses of smaller debris. (2) *The Valley Stage*, in which the valley sides are further apart and less steep, the current less strong, and the debris transported smaller in both size and quantity. (3) *The Plain Stage*, in which there is no well-marked valley, the current of the river is sluggish, and only the finest particles of mud can be transported.

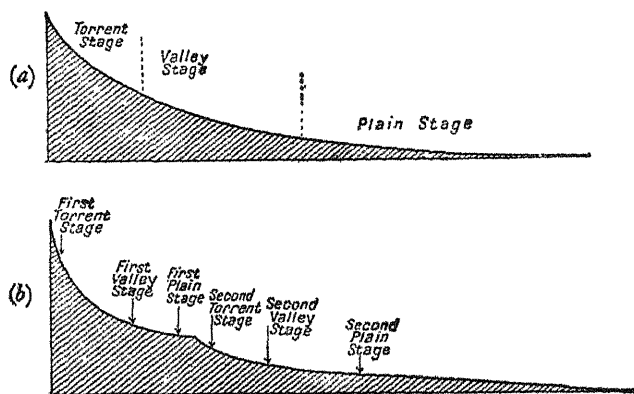


FIG. 54. RIVER PROFILES

(a) Normal profile. (b) Abnormal profile (the Severn).

On such plains rivers often deposit so much sediment in their beds and on their banks that they become raised well above the level of the surrounding plain, e.g. the Po, the Hwang-ho, the Mississippi. Such rivers are obviously liable to cause disaster by overflowing or bursting their banks, even though the natural levees, or raised banks, may be strengthened and raised by man.

The material swept down by a river is deposited in part on the valley floor, and in part on the flood plain, but vast quantities of fine mud are carried down to the sea to build up sand-bars

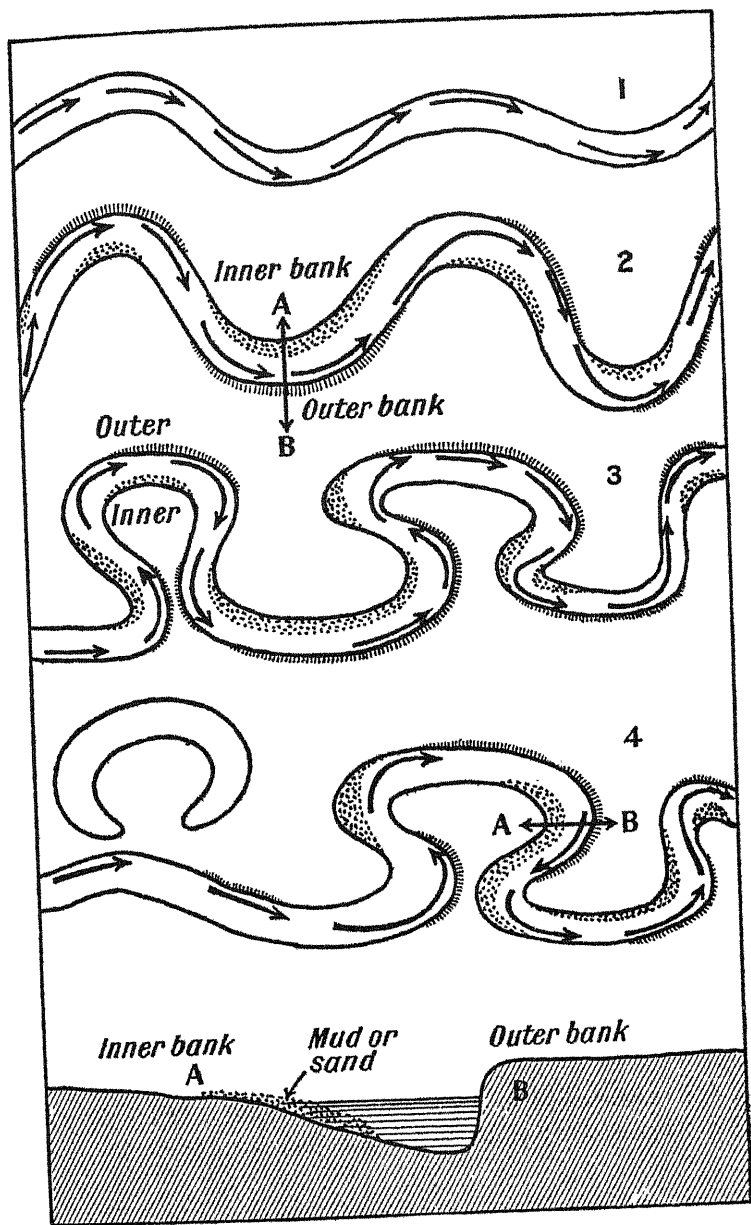


FIG. 55. THE DEVELOPMENT OF MEANDERS

and deltas. The Mississippi, for example, carries down to the Gulf of Mexico over 400 million tons of sediment annually.

In the lower part of the valley stage and in the plain stages rivers wind about a good deal, forming meanders (so named from the river Meanderes in Asia Minor). As shown in Fig. 55 the current swings from side to side, undercutting the outer bank of the curve, and depositing mud and sand near the inner bank. The effect of this undercutting is to widen the meander until eventually the narrow neck of land between two meanders is cut through, thus straightening out the course of the stream, and leaving a cut-off or ox-bow lake (see Fig. 55).

Although the majority of streams have a profile similar to that shown in Fig. 54A, others have abnormal profiles (Fig. 54B). The majority of such abnormal profiles are due to the process of *river capture*. For the understanding of this process it is necessary to realize that rivers not only cut down their beds, but also 'eat back their heads,' i.e. their sources tend to work further and further back into the highland. The rate at which rivers 'eat back their heads' depends on such factors as the

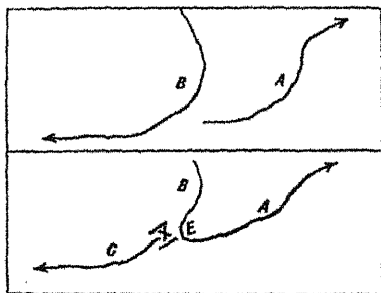


FIG. 56

slope of the land, the hardness of the rock, and the volume of water. Suppose that river A in Fig. 56 has, for one or more of the above reasons, a greater cutting power than river B. Then in course of time its source will work backwards until it undercuts the river B, whose waters

will be diverted as shown in the lower diagram. Here river A has 'captured' river B, and C is a 'beheaded' stream. The

evidences of river capture in such a map as Fig. 56 are the 'elbow of river capture' at E and the dry gap at X.

The rivers of the British Isles show many examples of river capture, some of which are illustrated in Fig. 57.

Glaciers and ice sheets are formed wherever more snow falls in winter than can be melted in summer. The surplus accumulates from year to year and eventually is compressed

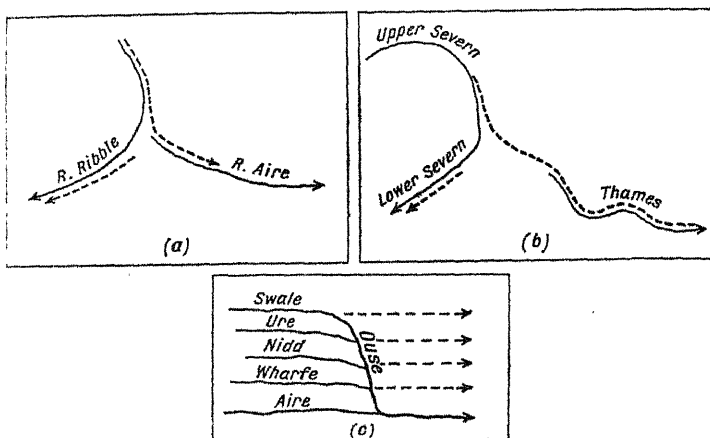
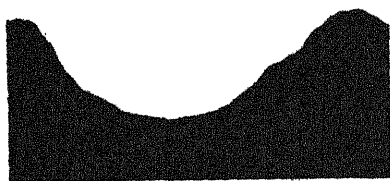


FIG. 57. EXAMPLES OF RIVER CAPTURE

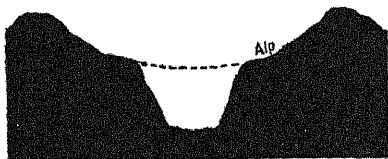
----- Former course. ————— Present course.

to form ice, which is pushed downwards and outwards from the gathering ground. Boulders frozen in the base of the glacier act like the teeth of a file and scrape away the rocks and soil underneath the glacier, thus deepening the valley through which it passes. Many of the valleys of the highlands of Scotland, Wales, and Switzerland owe their present U-shape to the over-deepening action of the ice. Before the Ice Age valleys would have normal outlines as shown in Fig. 58. During the Ice Age glaciers were over-deepening these valleys

so that when the ice melted the outline was as shown in Fig. 58. In the Alps the high shoulders are known as 'alps,' and provide valuable pasture in summer-time when they are free from snow.



Unglaciated valley



Glaciated, overdeepened valley

FIG. 58.

NORMAL AND OVER-DEEPEINED VALLEYS

completely fill the valleys and hide former hills. It very frequently happens that the drift is exceedingly fertile as it is composed of 'rock flour' formed by the grinding up of many different types of rock. Sometimes, however, the glacial drift is so studded with boulders as to be of little use for farming. Glacial drift of this type is known as boulder clay.

Waterfalls and Lakes. These are formed where a barrier—usually of hard rock—extends across a river. The river, however, is constantly engaged in wearing away the waterfall by undermining the layer of hard rock. As a consequence of this action the waterfall is constantly retreating upstream, and eventually the whole course of the stream is evened out and the waterfall disappears. The former existence of the waterfall is, however, frequently marked

Glaciers, like rivers, build up the land surface, for when the ice melts, mud and sand are deposited. Such glacial deposits are known as *moraine* when arranged in heaps or ridges, or as *glacial drift* when they form irregular sheets. In many cases the deposit of glacial drift is so thick as to

by a gorge which shows the track taken by the retreating waterfall. The gorge below the present Niagara Falls is a good example of this process. The Canadian part of the Niagara Falls is being cut back at the rate of 500 feet per century, and failing preservation by man the falls will eventually disappear. The same process can be seen at work in any small waterfall in our own country, and it is often

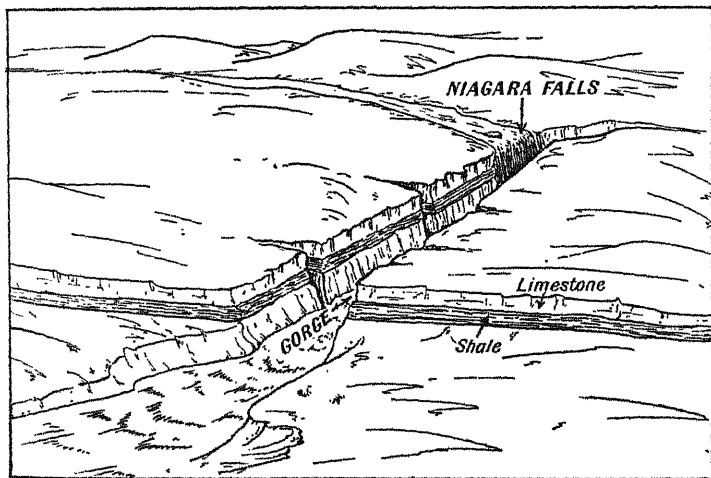


FIG. 59. NIAGARA FALLS AND GORGE

possible to distinguish miniature counterparts of all the major features of such great waterfalls as Niagara.

Lakes are generally formed by a barrier across a stream. The most frequent types of barriers are glacial moraine, lava flows, and landslides. Some lakes, however, owe their origin to the scooping out of hollows in the valley floor by a glacier. Most of the lakes of Great Britain are due either to the existence of a dam of glacial moraine, or to a rock basin scooped out by a glacier. Lough Neagh in Ireland, the largest lake

in the British Isles, owes its origin to the blocking up of the river Bann by a sheet of lava.

Lakes, like waterfalls, are transient features of the landscape. They tend to disappear for two reasons. In the first place they are gradually filled up at the upper end by a deposit of sediment brought down by the rivers. In the second place, the barrier at the mouth of the lake is gradually worn down by the river, and the lake is thereby drained. Many

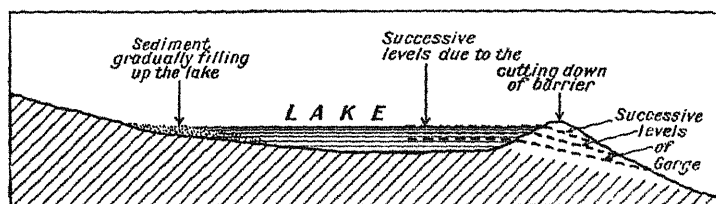


FIG. 60. THE SILTING AND DRAINING OF A LAKE

of the flat fertile valleys in the highlands of Scotland and in Wales mark the sites of former lakes.

Action of the Sea. No one who has stood on a rocky headland can doubt that the sea is a great erosive agent. The destructive power of the sea is due not only to the force of the waves themselves, but also to the fact that they are armed with boulders which they throw against the face of the cliff. Parts of the east coast of Yorkshire and Norfolk have been rapidly worn away by the sea during historic times, and old maps of these coasts show villages where the sea coast now runs. The present church of Cromer, for instance, was built to replace one whose ruins lie many hundreds of yards out to sea.

The sea is also a constructive agent. Sand and mud, eroded from the cliffs or transported by the rivers, are swept into the bays and there deposited. In this way shallow bays are gradually filled up, and although Great Britain is losing

every year a large area of land by the action of the sea, yet more is added than is lost.

SOME TYPES OF COAST

Coasts which run parallel to the grain of the land are known as *concordant* coasts, while those which run across the grain of the land are known as *discordant* coasts.

Concordant coasts are frequently straight and harbourless, but in cases where the land has subsided the sea has flowed into the valleys and formed deep land-locked harbours, as in Fig. 61.

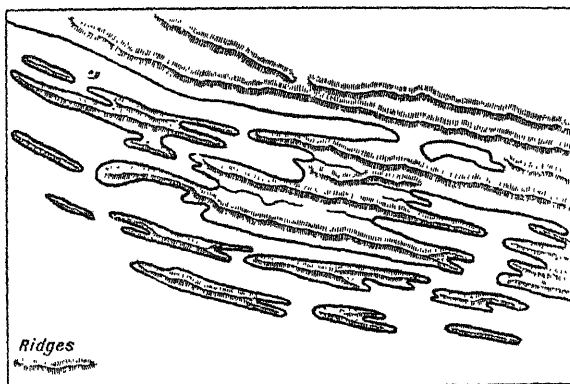


FIG. 61. THE DALMATIAN COAST (CONCORDANT)

Examples of harbourless, concordant coasts are Palestine, Syria, and the Guinea coast-lands of West Africa, while the Dalmatian coast on the eastern side of the Adriatic Sea is an excellent example of a 'drowned' concordant coast.

Discordant coasts are generally characterized by deep, many-branched inlets which form excellent harbours. Good examples are the south-west corner of Ireland, the south-western peninsula of England, and the north-western corners of France and Spain. As the coast of the Atlantic Ocean is predominantly

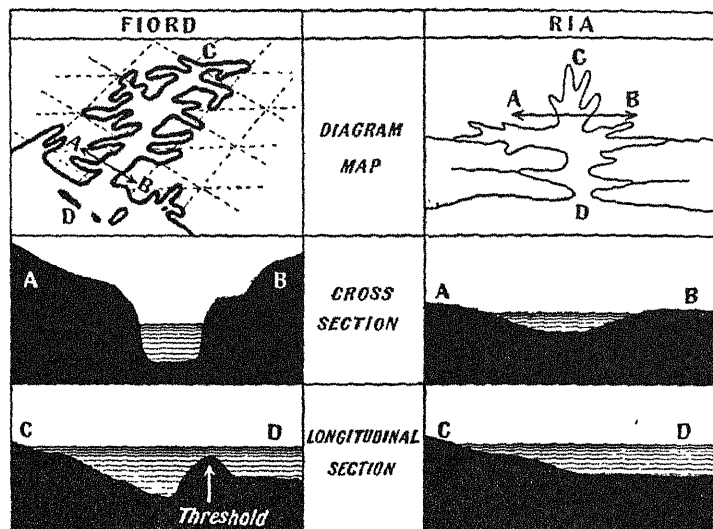


FIG. 62. COMPARISON OF FIORD AND RIA

discordant, this type of coast is often called the Atlantic type, while the concordant coast is sometimes called the Pacific type.

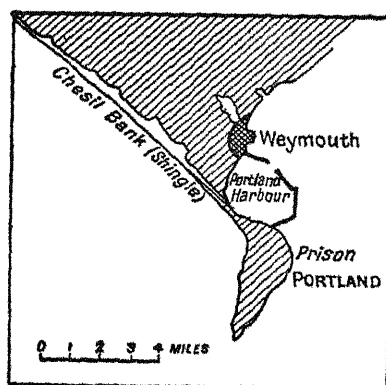


FIG. 63. THE ISLE OF PORTLAND

Fiords. Characteristics of fiords, which distinguish them from other types of indented coasts, are:

1. The frequent angular bends of both the main channel and of tributary fiords. The directions of the channels are, in many cases, determined by lines of fractures which cross each other as in Fig. 62.

2. In cross-section the fiord is typically U-shaped. As in the case of the over-deepened valleys of the Alps (see Fig. 58) the precipitous sides of the fiords are in most cases due to the action of glaciers.

3. A longitudinal section shows a deep basin within the fiord, and a shallower 'threshold' separating the basin from the open sea. The Scottish lochs are of the fiord type, but the land has not, in general, subsided far enough for the threshold to be submerged, so it remains as a narrow neck of land separating a land loch from a sea loch.

The principal fiord coasts of the world are those of Norway, Labrador, British Columbia, and south-western New Zealand.

Rias are formed by the partial drowning of river valleys. They differ from fiords in the following ways:

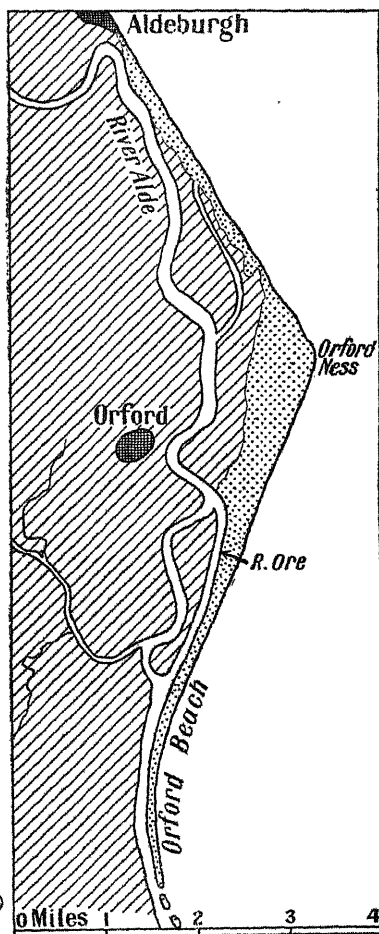


FIG. 64. ORFORD BEACH

1. The tributary channels enter the main one at normal angles.

2. Each branch of the ria has a stream flowing into it.

3. In cross-section the ria shows a smooth, even curve.

4. A longitudinal section shows the absence of a threshold.

Excellent examples of rias are to be found on the discordant coasts of north-western Europe.

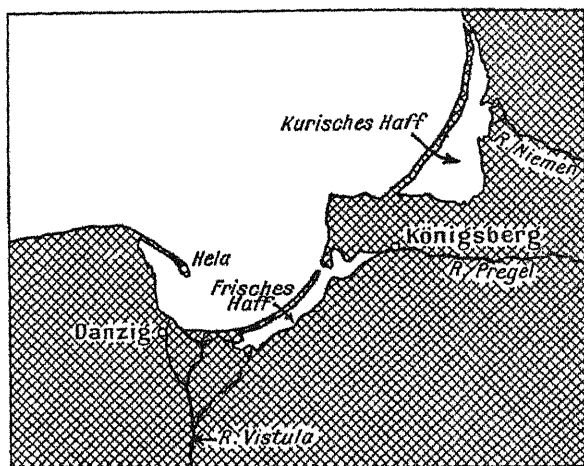
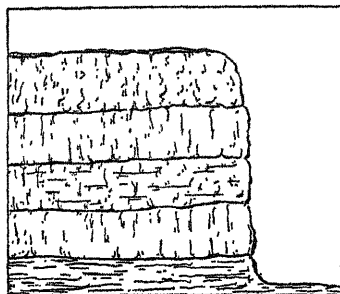


FIG. 65. THE HAFF COAST OF THE BALTIC

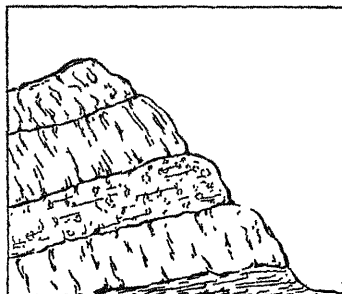
Shingle-banks and sand-spits. Pebbles derived from cliffs eroded by the sea, and sand brought down by the rivers, are often deposited as shingle-banks and sand-spits running roughly parallel to the main coast. Excellent examples in the British Isles are Chesil Bank, which links the 'Isle' of Portland to the mainland, the 'hook' of Spurn Head, and the long shingle bank which has deflected the river Alde southward (see Fig. 64). Examples on a much larger scale are to be found on the northern shores of the Gulf of Mexico, the

east coast of the United States (south of Cape Hatteras), and the southern coast of the Baltic (see Fig. 65).

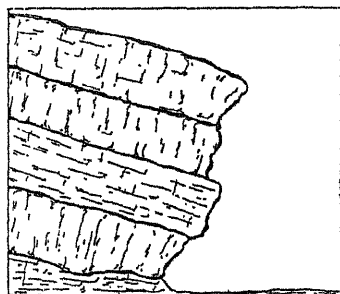
Cliffed coasts. Where the coast is backed by hard rock which



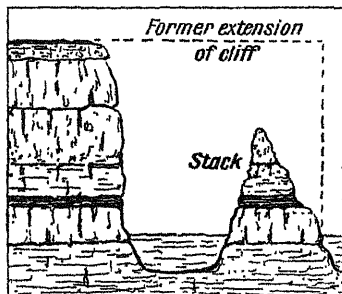
Vertical



Receding



Overhanging



Stack left by erosion of cliff

FIG. 66. TYPES OF SEA CLIFFS

stands up as ridges on the land surface, rocky promontories occur. Flamborough Head, for example, marks the point where the chalk Wolds run out to sea, and the seaward ends of the North and South Downs are marked by South Foreland and Beachy Head respectively.

The height of such headlands is approximately the same as the ridge of which it is the terminus, and the angle of slope

of the cliff is determined partly by the hardness of the rocks and partly by the dip (see Figs. 66 and 67).

TYPES OF ROCKS

Everybody must be familiar with the great variety of pebbles on a rocky beach. They differ not only in colour, but also in hardness and structure. Some are quite soft, while others are so hard that they cannot be scratched with a knife. Some are obviously formed of grains of sand arranged in layers, while others contain crystals of hard minerals. These various types of pebbles have come from different parts of our coasts, and indicate the great variety of rocks which compose the surface.

Rocks are generally classified according to their mode of origin. *Igneous rocks* are those which have been formed by cooling from a molten condition. The two chief classes of igneous rocks are volcanic rocks, such as basalt, which are formed by the cooling of lava which has been poured out on the surface of the earth, and plutonic rocks which are formed by the cooling of liquid masses of rock deep down in the earth's surface. The best-known example of these plutonic rocks is granite.

The second great class of rocks is the *sedimentary* type. These are rocks which are formed by the compression of sediments laid down in a lake or in the sea. The type of rock is determined by the type of sediment. Thus, sand when compressed and cemented together forms sandstone; fine grain material deposited in layers forms shale; and the finest particles of all form clay. Limestone and chalk are both forms of calcium carbonate, derived in all probability from the limy shells of creatures which live in the sea.

The types of rock have a great influence on the scenery

and on human activities. Thus, granite which weathers only very slowly and so produces little soil, generally forms barren highlands, such as Dartmoor. Coarse sandstones, which are very porous, generally form rather barren heath land and

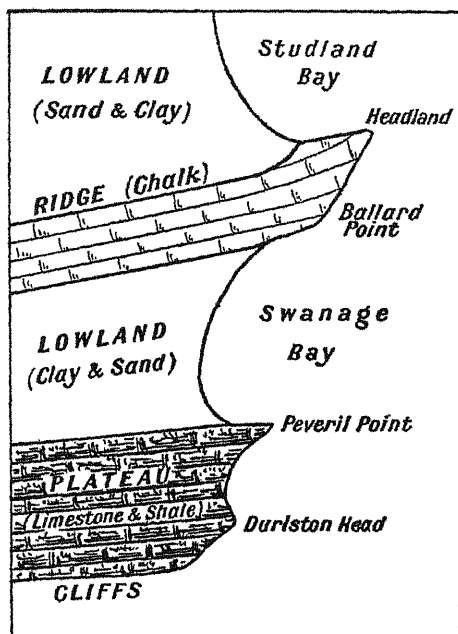


FIG. 67. RIDGES TERMINATING AS HEADLANDS

forest land. Clay, which holds water very well, forms good farm land if well drained, but is apt to suffer from water-logging, and may be too heavy to work easily. It is, therefore, frequently laid down to grass and forms good dairying land.

Limestone and chalk are both very porous, and the calcium carbonate of which they are formed is slightly soluble in

rain-water; consequently, any small cracks in the rock are gradually deepened and widened so as to form crevices down which the water disappears. As a consequence, highlands composed of limestone and chalk are always dry and often bare of vegetation.

The 'karst' type of scenery is characteristic of highlands composed of pure limestone. The hills north of the Craven district in Yorkshire are of this type. Wide platforms, consisting of limestone blocks separated by deep crevices, stretch for miles; rain immediately disappears down these crevices and rivers disappear down swallow holes and pot-holes leaving the surface quite waterless. The rivers pursue winding courses underground and may reappear in caves many miles from the point at which they disappeared.

The chalk hills of south-east England are characterized by rounded contours, the lack of surface streams, and by a covering of short, wiry grass which is very suitable for sheep-rearing.

Escarpmnts are formed where there are alternate layers of harder and softer rocks, such as limestone and clay. The weather wears away the soft rock to form valleys, and leaves the harder rock standing out as ridges which are steep on one side and gradually sloping on the other side. Examples of such escarpments may be found in most hilly districts, but they are particularly noticeable in south-eastern England. One great escarpment is formed by the limestone hills of the Cotswolds, Northampton Uplands, Lincoln Uplands, and the North York Moors. This is succeeded to the south-east by a broad clay vale, and beyond this again the chalky hills of the Chilterns, the East Anglian Heights, the Lincoln Wolds, and the Yorkshire Wolds rise up as notable escarpments. Similar escarpments form concentric rings around the Paris basin.

CHAPTER VI

MAP-MAKING AND MAP-READING

IMAGINE yourself to be a Robinson Crusoe on a 'desert' island. How could you make a map of it? Assuming that the island were small and fairly level, the simplest way would be to take a *traverse* across the island in the following way. Mark out a straight line AB across the island (see Fig. 68). Starting at A, walk to C, opposite a prominent point C_1 on the coast; measure AC and CC_1 , then proceed to D, measure CD and DD_1 , continue with points E, F, G, etc. From these results a rough map of the island may be obtained. The chief difficulty of this method in actual practice is to ensure that the lines CC_1 , DD_1 , etc., are at right angles to AB. The simplest way of doing this is to divide a rope or chain in the proportion 3 : 4 : 5; then the triangle made by the three divisions will contain a right angle, which may be used to get the offset CC_1 (see Fig. 68).

A second method of plotting various points is by means of the compass. Lay out a measured base line AB. From A take the angular bearings of points 1, 2, 3, etc., then move to B and get the angular bearings of points 1, 2, 3 again. Draw AB to scale and plot points 1, 2, 3, etc., by drawing lines representing the observed bearings.

Note. 1. Angular bearings are always measured from north round towards the east, that is, in a clockwise direction. Thus, if point 4 is to the north-west of A its angular bearing will be 315° east of A.

2. A prismatic compass—so-called because a small glass

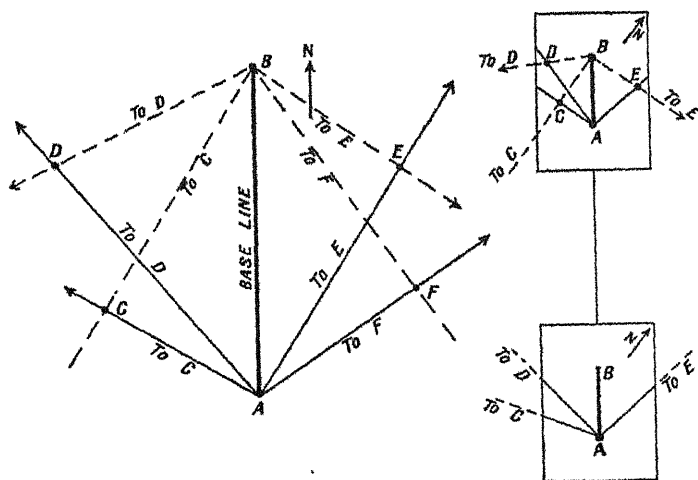
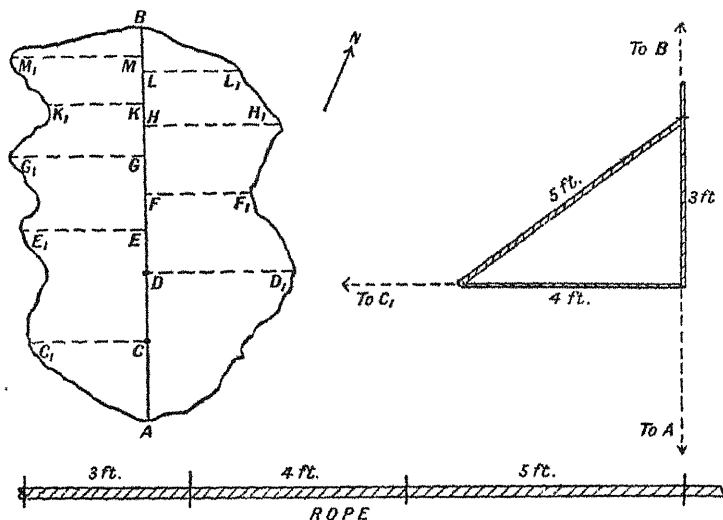


FIG. 68. METHODS OF SURVEYING

prism is used to facilitate the sighting and reading of the figures—is desirable for angular measurements of this type.

A *plane table* may be used to get the above results without taking angular measurements (see Fig. 68). Set up the plane table over point A, and draw the base line AB to scale. Now sight points C, D, E, etc., in turn, and draw lines towards them. Now move the plane table to B, set it so that point A on the paper is in line with the actual point A, and again sight points C, D, E, etc. The intersection of the lines will fix the positions of the points.

THE ELEVATION OF THE LAND

A simple method of obtaining heights is illustrated in Fig. 69. Staves, marked in feet and inches, are set up at A and B, and midway between them, at C, is a sighting tube

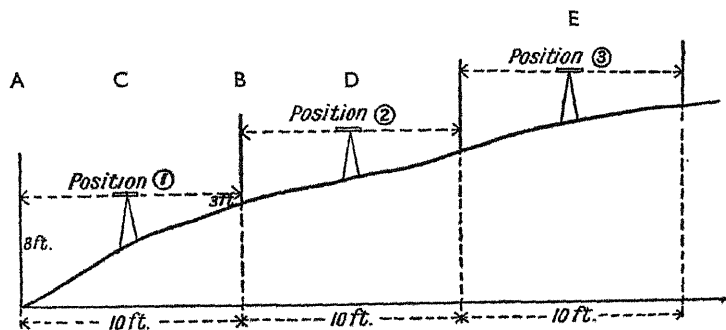


FIG. 69. DETERMINATION OF HEIGHTS

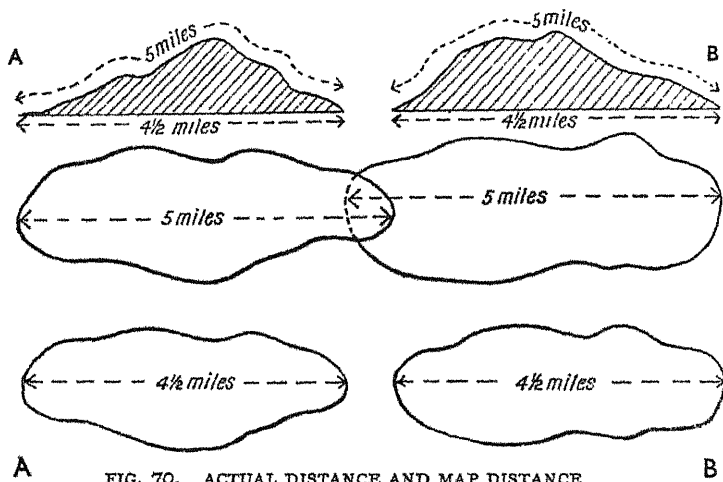
on a stand. Level the tube, and read the heights on staves A and B; if these are, say 8 feet and 3 feet respectively, then the point B is 5 feet higher than A.

Further readings may be obtained by moving the sighting tube to points D, E, etc.

(It will, of course, be realized that the above methods are only for illustration of the methods or for rough measurements; actual surveying requires instruments such as the theodolite, by which very accurate readings can be obtained.)

PLANS AND MAPS

Fig. 70 shows the cross-sections of two islands; in each case the breadth as measured over the hills is 5 miles, but as measured horizontally it is only $4\frac{1}{2}$ miles. Which of these distances is to be given on a map of the island? Obviously



we cannot use the actual distance as measured on the land, for if we measured 5 miles from A and 5 miles from B, the islands would overlap. We must, of course, use the horizontal distance ($4\frac{1}{2}$ miles). So we see that the distance shown on a map is less than the actual distance except where the land is quite level. In other words, every map is a *plan* or bird's-

eye view. Though there is no essential difference between a map and a plan, maps on a very large scale, which show such details as the areas of individual fields and the shapes of individual buildings, are called plans. Thus, the British Ordnance Survey uses the name 'plan' for any of its maps which are drawn on the scale of six or more inches to the mile. We speak, for instance, of the 'six-inch *plan*' and the 'twenty-five-inch *plan*,' but of the 'one-inch *map*,' when referring to maps on the scales of six inches, twenty-five inches, and one inch to the mile respectively.

CONTOURS

The modern method of representing the height of the land on a map is by means of contours. These are lines joining points of the same height above sea-level. On one-inch ordnance maps the 'contour interval,' or difference of height between successive contours, is fifty feet; but in atlas maps the contour interval is greater, and often varies with the height of the land. On such maps, too, the spaces between the contours are tinted in various colours, giving what is known as a 'layered' contour map.

Contour maps show not only the *height*, but also the *slope* and the *form* of the land. The slope of the land can be estimated by the closeness of the contours—where they are close together the slope will be steep, and *vice-versa*. Note must, however, be taken of the scale of the map and of the contour interval.

Consider, for example, the following cases:

Map 1

Scale one inch = 100 miles.

Contour interval = 500 feet.

Distance between contours = 1 inch.

Gradient: 500 feet in 100 miles = 5 feet in 1 mile.

Map 2

1 inch = 50 miles.

Contour interval = 250 feet.

Distance between contours = $\frac{1}{2}$ inch.

Gradient: 250 feet in 25 miles = 10 feet in 1 mile.

The *form* of the land is shown by the form of the contours (see Fig. 71). Thus valleys are shown by V-like contours

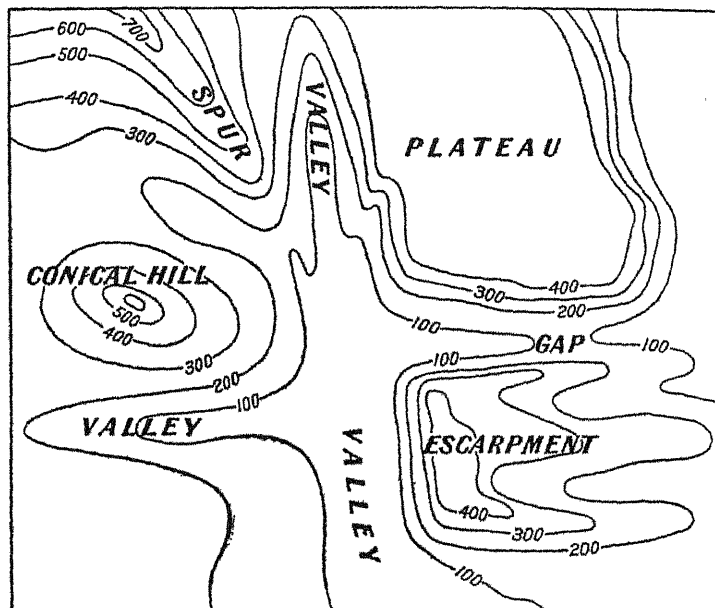


FIG. 71. LAND FORM SHOWN BY CONTOURS

pointing to the higher land; spurs by V-like contours pointing to the lower land; conical hills by evenly-spaced rings of contours; escarpments by contours which are close together on the steep 'scarp' slope, and wider apart on the gentler

'dip' slope; plateaus by closely spaced contours at lower levels and widely spaced ones at higher levels.

MAP PROJECTIONS

Every *flat* map represents part of the *curved* surface of the earth; but no curved surface can be laid flat without stretching it round the edges; consequently no flat map can be quite

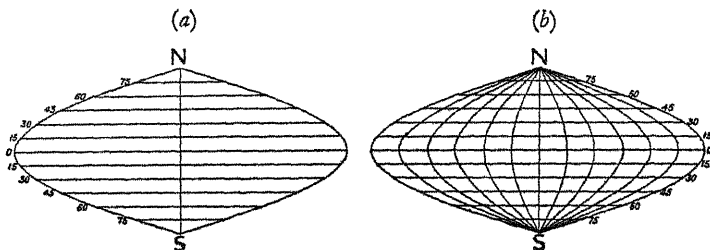


FIG. 72. SANSON FLAMSTEED'S PROJECTION

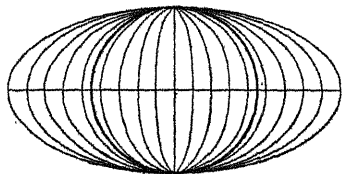


FIG. 73. MOLLWEIDE'S PROJECTION

accurate. Large maps of small areas are, however, almost absolutely accurate; but special methods have to be adopted when we try to make a map of the whole, or a large part, of the earth's surface. The various devices for representing the curved surface of the earth on a flat map are known as *map-projections*.

One simple method of representing the whole earth is to measure each circle of latitude, and represent it by a straight

line of the same length, the various lines of latitude being drawn the same distance apart as they are on the globe. We then get a drawing like Fig. 72A. Lines of longitude may be inserted by dividing each parallel into 360 divisions (or 12 *if only 15-degree* intervals are needed, as in Fig. 72B). The resulting map 'net' is equal in area to the whole globe. The projection is known as Sanson Flamsteed's.

Another projection which gives the correct areas of the land masses is Mollweide's (see Fig. 73). Here the large ellipse is exactly equal to the curved surface of the sphere, and is twice the area of the circle formed by longitude 90° W. and longitude 90° E. The disadvantage of Mollweide's projection is the distorting of the land near the North and South Poles. In many modern maps this is avoided by a system of drawing which has the effect of pulling the continents apart near the poles.

Other projections enable the lines of latitude and longitude to be drawn at right angles to each other, thus giving a very clear map. Unfortunately such maps are always very inaccurate except near the Equator. Mercator's projection, for example, makes Greenland seem larger than Australia though it is, in fact, only one-third the size.

The majority of the 'country' maps in our atlases are on a conical projection which can be obtained by placing a cone over the globe, 'projecting' the lines from the globe on to the cone, then unrolling the cone to make a flat surface.

CHAPTER VII

SOURCES OF POWER AND METALS

1. **Coal.** In addition to being the world's principal source of power, coal is an important raw material, for from it may be manufactured fuel oil, motor spirit, dyes, disinfectants, and a host of chemicals, many of which are themselves the basis of manufacturing industries.

The principal types of coal are:

Anthracite, which is composed almost entirely of carbon, and burns only with a forced draught, when it gives off great heat, but no smoke or flame. It is used in America in the central-heating furnaces of houses and sky-scrapers, and in Britain for certain industrial processes. The chief sources of the world's supply are Pennsylvania (p. 166) and South Wales (p. 399).

(b) *Steam coal* which contains a little volatile matter, but, like anthracite, burns without flame or smoke. It is in great demand as bunker coal for steamships, since it supplies great steaming power in small space. One of the world's chief sources of supply is South Wales.

(c) *Bituminous coal*, which contains sufficient volatile matter to cause smoke and flame. There are many grades of this type, including coking coal and gas coal.

(d) *Lignite*, which is a poor variety of coal, light in weight and light in colour. Its heating power is so low that it was formerly considered almost worthless, but in modern times it is much used in Germany and other countries for the manufacture of by-products and the generation of electricity.

Coal is very unevenly distributed over the world, and there are in fact, only four areas where great supplies exist, viz; (1) Central and eastern North America. (2) North-western Europe. (3) Southern and central Russia. (4) Eastern Asia.

The *United States* is the world's leading producer of coal, and has probably the largest reserves of any country. The Appalachian Field in the east produces nearly three-quarters of the country's total. *Great Britain* is the second most important coal-producing country in the world; in fact, we

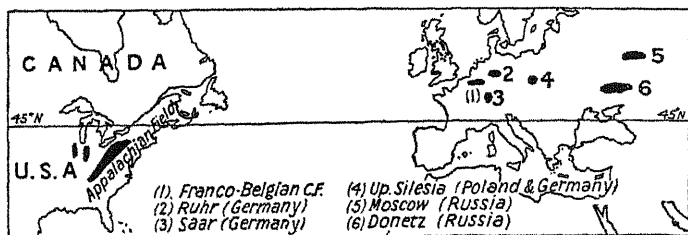


FIG. 74. COALFIELDS OF NORTH AMERICA AND EUROPE

produce far more than is needed for our own industries, so that considerable quantities are available for export. In *Europe* the coalfields occur in a belt which stretches from the Strait of Dover to central Russia. The chief fields are shown in Fig. 74.

In *Asia* there are large reserves of coal in southern Siberia and in northern China. The former are now being energetically developed by the Soviet Government, and the latter may be developed by Japan if and when she succeeds in establishing firm control over China. In the southern hemisphere the only areas where much coal is mined are the Union of South Africa and eastern Australia.

2. *Petroleum*. Where petroleum 'pools' occur they are generally in some such position as shown in Fig. 75. It

should be noted that neither the oil nor the water form actual pools, but merely fill up the small spaces between the particles of the porous rock. As oil is lighter than water it rises to the top of the fold, but cannot get further because of the impervious cap above. The diagram also indicates how difficult it may be to locate an oil pool from the surface. A boring at A would find nothing but water, one at B would get gas

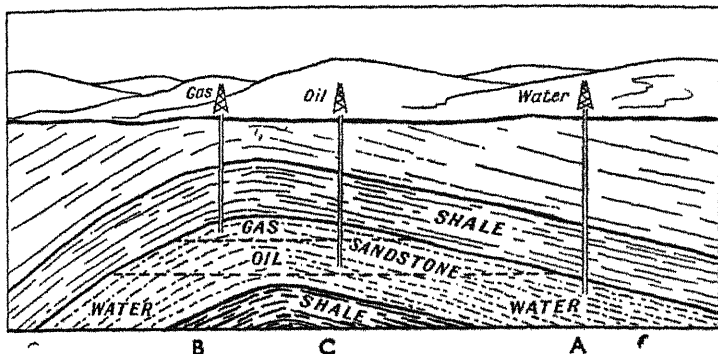


FIG. 75. OCCURRENCE OF PETROLEUM

and then oil, while the one at C would yield oil until the whole 'pool' was exhausted.

Crude petroleum, as obtained from the wells, is made to yield many products of which the chief are petrol (or gasoline as it is called in America), fuel oil (used instead of coal on ocean steamers, and to a smaller extent on railway engines, and certain types of motor cars), paraffin, lubricating oils, and vaseline. Natural gas, which is often tapped in oil-bearing districts is also widely used as a source of heat and light.

Fig. 76 shows the world production of petroleum. Note: (1) The preponderant importance of the United States. (2) The lack of oil in the British Empire. (3) The small production in Europe, where Rumania is the only important source of oil.

An important point which is not brought out by the map is that though Britain produces no oil British capitalists control the production of a large part of the world's oil.

3. **Water Power.** Water wheels have been used as a source of power for thousands of years, but the large-scale transformation of water power into electrical power dates only from the end of last century. In modern hydro-electric schemes the water is allowed to fall through pipes on to tur-

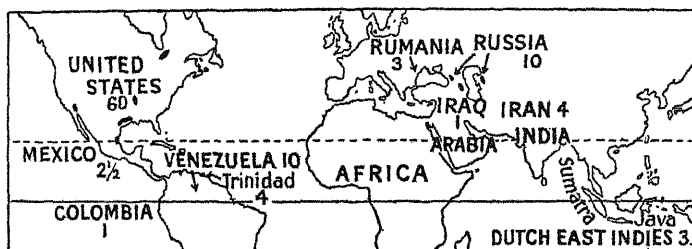


FIG. 76. WORLD PRODUCTION OF PETROLEUM
Figures show percentages.

bines situated at the foot of the waterfall or in the valley below a lake or reservoir.

Factors which lead to large-scale development of hydro-electricity are: (1) A mountainous surface. (2) A regular supply of water either from rivers or lakes. (3) A great demand for electrical power either for domestic lighting or the running of factories and railways. (4) Inability to produce electricity more cheaply from coal.

Note: (a) The United States and Canada are the chief producers of hydro-electricity. Both these countries have large supplies of coal, but cost of transport is high, whereas electricity can be transmitted cheaply over long distances. (b) The European countries which develop most hydro-electricity are those

which have high mountains, many industries, and little coal. (c) Japan has large supplies of hydro-electricity (relate this to the mountainous surface, the heavy rainfall, and the lack of coal). (d) Africa, though it has nearly half the world's available water power (relate this to the steep fall near the coast), uses hardly any such power (relate this to the lack of demand). (e) Great Britain has a very small amount of developed water-power, since we have abundance of coal.

METALS

1. **Iron.** Iron is by far the most important metal used by man, and possession of, or easy access to, supplies of iron are essential for all manufacturing countries. Iron is never found pure, but in the form of ore, which will not usually be worth working unless it contains 25 per cent of iron. In the manufacture of iron and steel the ore is first smelted in a blast furnace which is filled with iron ore, coke, and limestone. Heat from the burning coke melts the ore, the impurities mix with the limestone and are drawn off as 'slag,' and the molten iron is run off into moulds or 'pigs.' This pig iron is really the raw material of the iron and steel industry. Articles of cast iron are made by resmelting the pig iron and running it off into moulds of the required shape. Wrought iron is made by reheating the pig iron, burning out the carbon, and beating or rolling the pure metal thus obtained. Steel is made by adding a small percentage of carbon to pure molten iron.

Fig. 77 gives the chief iron- and steel-producing countries of the world. Note: (1) The predominance of the United States, which produces nearly half the world's iron, and nearly half the world's steel. (2) That four great Powers—Britain, Germany, France, and Russia—have a large production of

iron and steel (though Germany, and to a smaller extent, Britain, has to rely largely on imported ores. (3) That two of the great Powers—Japan and Italy—are not shown in the diagram as they have a relatively small production (Japan hopes to increase her production enormously by using the ores of Manchuria and China—see p. 260).

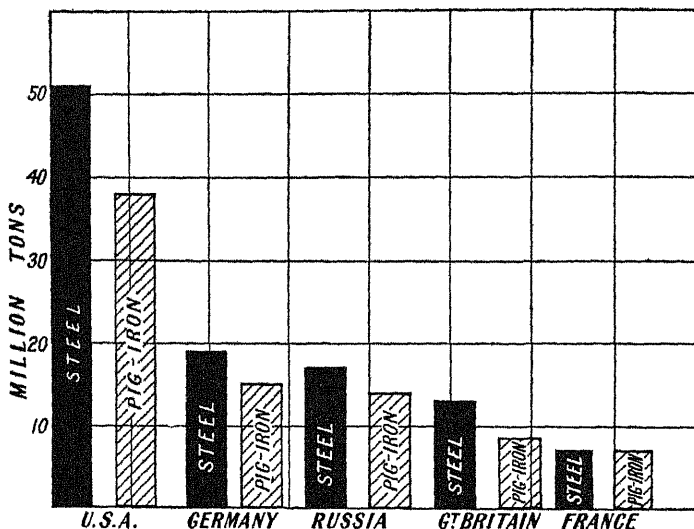


FIG. 77. PRODUCTION OF IRON AND STEEL

2. *Steel Alloys.* In modern times 'special steels,' each suitable for particular purposes, are made by mixing with the steel a small proportion of other metals to form an alloy. The chief of these steel-alloy metals are:

(a) *Nickel*, which is used for making stainless steel, magnetic steel, and armour plating. About 80 per cent of the world's nickel comes from the Sudbury district of Canada, five per cent from the French island of New Caledonia, and small

quantities from Norway, Greece, and Finland. Brazil has large deposits which are not yet worked.

(b) *Manganese*, which is added to steel to increase its ductility. Over half the world's manganese is produced in Russia, chiefly in the Caucasus district; India, Gold Coast, the Union of South Africa, and Germany are also important producers.

(c) *Tungsten*, which gives a specially hard steel used for cutting tools and for armour plate and armour-piercing shells. About 40 per cent of the world's supply comes from southern China, other important producing countries being Burma, Malaya, Bolivia, and Portugal.

3. Copper was probably the first metal to be used by man and is still the most important non-ferrous metal. The vast increase in output in modern times is due mainly to the use of electricity. In a few districts pure copper is found, but most of the world's copper is mined as ore. Copper ore which is near a railway or a navigable waterway will often be worth mining if it contains only 2 per cent of copper, and the great bulk of the ores used contain no more than 5 per cent of copper. Some high-grade ores, however, contain as much as 80 per cent of copper.

The chief copper-producing country of the world is the United States, in spite of the fact that the copper deposits there are of low grade and difficult to work. Chile, the second largest producer, has the advantage of richer deposits and lower working costs, and her output of copper has doubled in the last ten years. The richest copper deposits in the world are in the Katanga District of the Belgian Congo and the neighbouring part of Rhodesia, the latter country being now the third in order of importance.

4. **Aluminium.** The chief producers of *bauxite*, the ore from which aluminium is obtained, are, in order of output, France,

Hungary, the United States, Dutch Guiana, British Guiana, Italy, and Jugo-Slavia. As smelting can only be done economically in an electric furnace the chief producers of *aluminium* are countries which have large supplies of cheap hydro-electricity—U.S.A., Germany, Russia, Canada, France, Italy, Scandinavia, Japan.

5. Tin. More than half the world's tin comes from the relatively small part of south-eastern Asia which includes

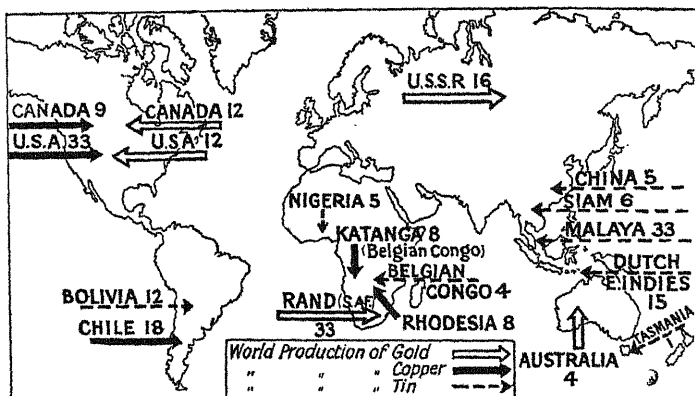


FIG. 78. PRODUCTION OF GOLD, COPPER, AND TIN

Sumatra, Malaya, Siam, and southern Burma. The only other major sources of supply are Bolivia, Nigeria, the Belgian Congo, and the province of Yunnan in southern China.

6. Silver, Lead, and Zinc are often found together in the same mineral vein, or in the same locality, notable instances being Broken Hill in New South Wales and Mount Isa in Queensland. Mexico produces about 40 per cent of the world's silver, as well as much lead and zinc; the U.S.A. produces 25 per cent of the world's silver, 33 per cent of the world's lead, and 30 per cent of the world's zinc. Other important producers

are Canada (lead and zinc), Spain (lead), and Burma (silver and lead).

7. **Gold** occurs either as veins running through quartz or other hard rocks, or as grains and nuggets in sand and other alluvial deposits; in the former case it is known as 'lode' or 'reef gold,' in the latter as 'placer' or 'alluvial' gold. Reef gold can only be obtained by installing expensive machinery for mining and crushing the rock, and is consequently exploited only by wealthy companies. Alluvial gold, however, may easily be washed out from the soft deposits by the individual prospector, and all the great 'gold rushes' of the world have been to alluvial gold deposits.

More than a third of the world's gold is obtained from the mines of the Witwatersrand ('Rand') district of the Transvaal. The only other very large producing countries are Russia, who has enormously increased her output in recent years, the United States, Canada, Australia, and Mexico, who together supply nearly half the world's gold. Gold is, however, one of the most widely distributed metals, and is found in payable quantities in a great number of countries. It is worthy of note that the British Empire produces 55 per cent of the world's gold.

SECTION II

REGIONAL GEOGRAPHY

CHAPTER VIII

NORTH AMERICA

GENERAL SURVEY

THE physical map Fig. 79 shows that North America consists of three main physical divisions, viz: the Western Cordilleras, the Central Lowlands, and the Appalachians.

1. **The Cordilleras**, or Rocky Mountain system, consists of three main ranges, viz. (a) the *Coast Range*, which is partially submerged in British Columbia; (b) the *Inner Pacific Range* which is known in Canada as the Cascades, in California as the Sierra Nevada, and in Mexico as the Western Sierra Madre; (c) *The Rockies*, which are the highest and most easterly of the Cordilleran ranges.

Between the Coast Range and the Inner Pacific Range is a great hollow which forms the Gulf of California, the central valley of California, Puget Sound, and the straits between the British Columbian islands and the coast. Between the Inner Pacific Range and the Rockies is a series of plateaus and inter-montane basins, the chief of which are: the British Columbia plateau, the Columbia-Snake lava plateau, the Great Basin, the Colorado Plateau, and the Mexican Plateau.

2. **The Central Lowlands** may be divided into the following sub-regions:

(a) *The Hudson Bay shield*, also known as the Laurentian shield and the Canadian shield. It is one of the oldest land

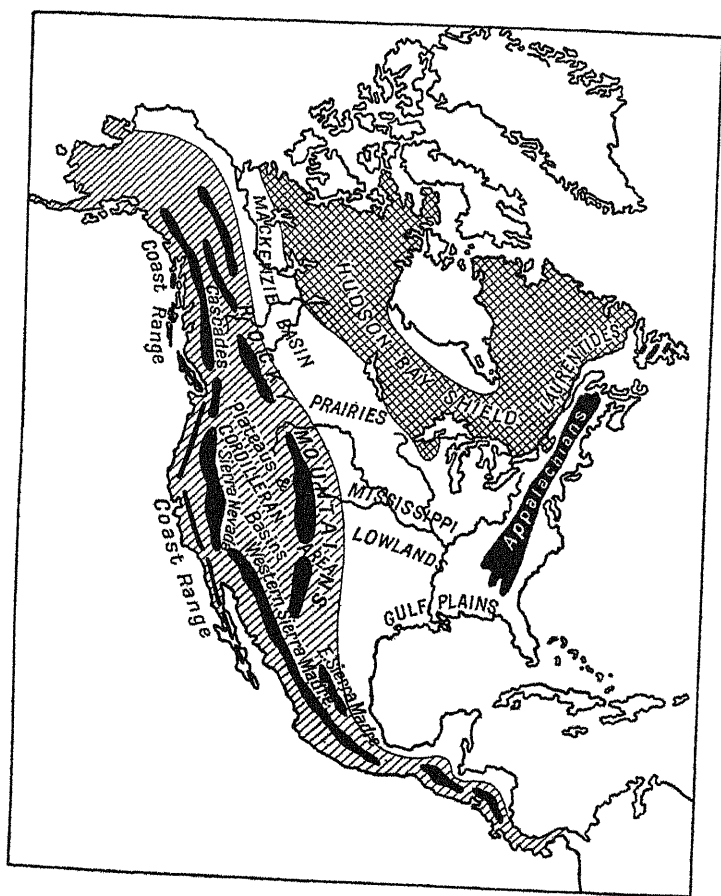


FIG. 79. NORTH AMERICA—PHYSICAL ELEMENTS

masses in the world, and during the course of ages it has been worn down to an almost level peneplain. During the Glacial Period ice-sheets scraped the soil from the slightly elevated areas and covered the lower parts with an irregular layer of 'drift' in the hollows of which lakes and swamps were formed.

(b) *The Mackenzie River basin*, which lies between the Canadian shield and the Rockies. Though the Mackenzie is one of the largest rivers in the world, it is not of great commercial importance as it flows to the Arctic Ocean and is ice-bound for eight or nine months each year.

(c) *The Prairies*, which stretch from the foot of the Rockies almost to the Great Lakes. The region is not a continuous plain, but is divided by slight escarpments into three 'prairie steps,' with average elevations of 800 feet, 1,600 feet, and 3,000 feet respectively. This region has already been mentioned as one of the great wheat lands of the world.

(d) *The Great Lakes and the St Lawrence basin*, between the Canadian shield and the Appalachians. The St Lawrence and the lakes which it drains form the finest system of inland waterways in the world, though the differences in levels have necessitated the construction of canals.

(e) *The Mississippi basin*, which comprises about 40 per cent of the surface of the United States.

The Mississippi rises in Lake Itaska, whose name is abbreviated from the Latin 'veritas caput'—true head. The average gradient over the 2,500 miles of its course is only 8 inches per mile, and for the last 1,000 miles before entering the Gulf of Mexico it flows over an almost dead level flood-plain, between high embankments or 'levees.' Its chief tributaries are the Missouri (the 'Great Muddy') and the Arkansas on the right bank, and the Ohio and the Tennessee on the left bank.

3. The Appalachian system is a very ancient range of

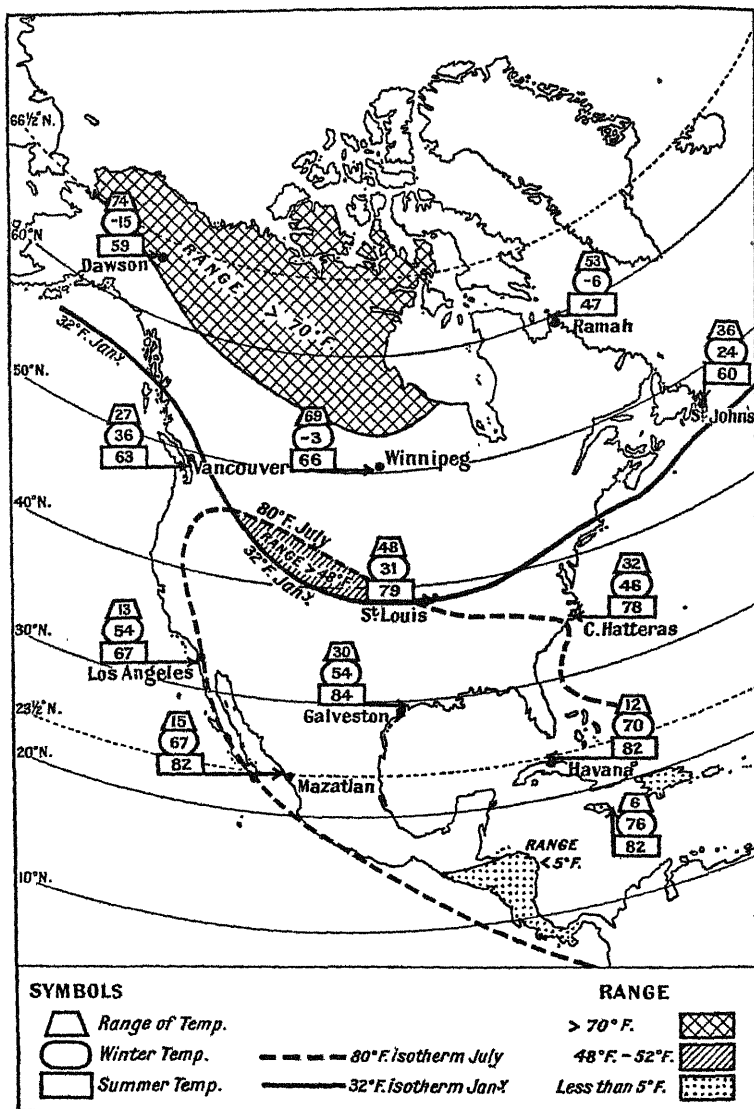


FIG. 80. NORTH AMERICA—TEMPERATURE

mountains which has more than once been worn down almost to sea-level and then uplifted again. It consists of the following structural elements (see Fig. 81): (a) *The Alleghany and Cumberland plateaus* in the west. (b) *The Appalachian valley*, which is drained by parts of several rivers. (c) *The*



FIG. 81. THE DIVISIONS OF THE APPALACHIANS

Blue Ridge. (d) *The Piedmont plateau*, at the eastern edge of which is the Fall Line, a fairly steep slope over which the rivers flow by waterfalls and rapids.

NEWFOUNDLAND

Newfoundland is not part of Canada, but a separate dominion, claiming, in fact, to be the oldest British dominion. The surface is barren and mountainous, and though the island is in the latitude of Britain the climate is much colder and the surrounding seas are frozen in winter (see p. 21, Fig. 15);

to South and Central America and to the Mediterranean countries of Europe. Some sealing is still carried on, and salmon are caught in the estuaries and packed in ice for export to Great Britain.

Iron ore is mined on Bell Island and sent to Canada, Britain, and Germany for smelting. Copper, lead, silver, and zinc are also mined in the western part of the island.

St. John's, the capital and chief port, is the eastern terminus of a single-line railway which runs across the island. Newfoundland is of great importance as the terminus of transatlantic cables, and as a stage on the newly established transatlantic air service from the mouth of the Shannon.

Newfoundland now includes a large part of the peninsula of Labrador on the mainland of North America. Though the region is rich in minerals and water-power, it is quite undeveloped, and practically all the 4,000 inhabitants, who include many Eskimos, depend on cod-fishing and sealing for a livelihood.

CANADA

The Maritime Provinces. The Maritime Provinces of Canada are New Brunswick, Prince Edward Island, and Nova Scotia with which is included Cape Breton Island.

Farming. Much of the surface is rocky and barren, but certain districts are exceedingly fertile. Among these are: (1) Prince Edward Island, the smallest, the most densely peopled, and the most intensively cultivated province in Canada; (2) the dike lands at the head of the Bay of Fundy, where the alluvial land was reclaimed by the building of dikes by French settlers three hundred years ago; (3) Annapolis valley on the western shore of the Bay of Fundy, which is the chief apple-exporting area of the British Empire.

The chief farm crops are hay, oats, potatoes, and root

crops, and in spite of the long cold winters, dairying is an important industry.

Lumbering. The region was formerly densely forested, but the supply of timber trees is now almost exhausted. The second growth of small trees is, however, cut for export to

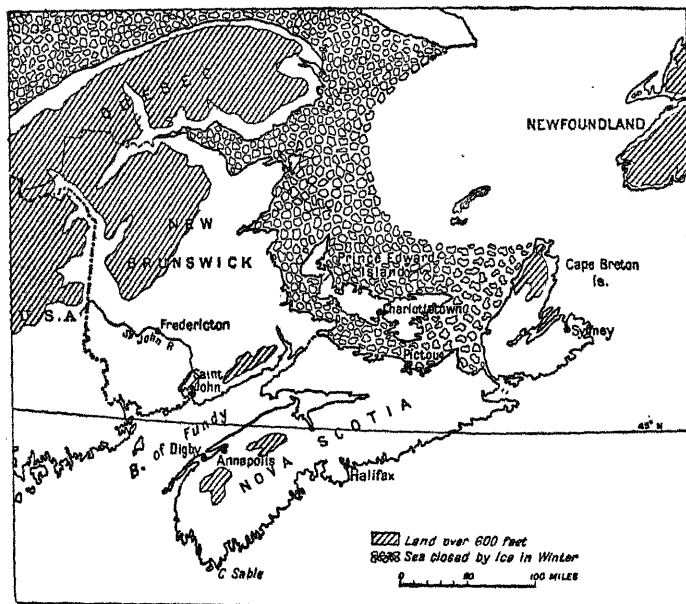


FIG. 83. THE MARITIME PROVINCES OF CANADA

the United States as pulp wood, and as a raw material for local pulp and paper industries.

Mining. Coal is mined at Sydney in Cape Breton Island, and at some other centres of lesser importance. It is used chiefly for smelting the iron ore brought from Bell Island, in Newfoundland.

Cities. Halifax and Saint John are of supreme importance

to Canada as the only large eastern ports which are ice-free in winter. Fredericton and Charlottetown are the capitals of New Brunswick and Prince Edward Island respectively.

The St. Lawrence Lowlands and the Great Lakes. Though the St. Lawrence estuary is closed by ice from December to April, it is one of the world's chief inland waterways. The northern side of the estuary is flanked by the barren Laurentian

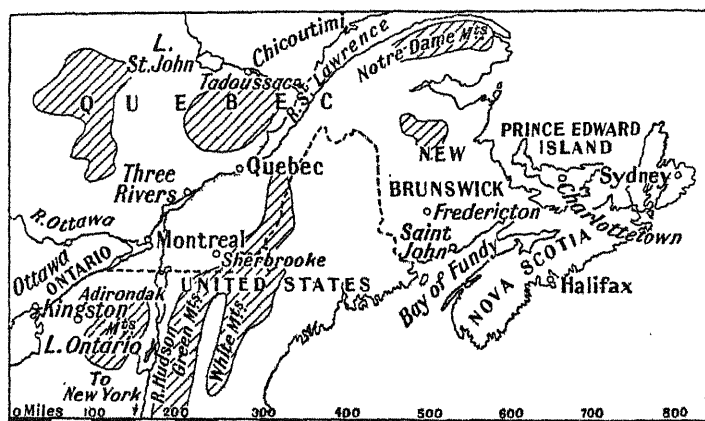


FIG. 84. THE LOWER ST. LAWRENCE

shield, and the only port of importance is Tadoussac, at the mouth of the Saguenay River, which drains from the fertile basin of Lake St. John. Chicoutimi, on the St. John River, is accessible by ocean steamers, and from this point a railway runs inland to Lake St. John and thence to Quebec.

On the southern side of the estuary the land is more fertile, and is inhabited by French-speaking people who are descendants of the seventeenth-century French colonists. They are engaged principally in dairy-farming, and though strongly individualistic in other respects they have adopted the

co-operative system for manufacturing and marketing their dairy produce.

The Eastern Townships is the area in the south-east corner of Quebec Province. It is important for the mining of asbestos and for the production of maple sugar. The chief city, Sherbrooke, manufactures textiles, machinery, and shoes.

Quebec, the oldest city in Canada and the capital of Quebec Province, was founded by the early French settlers on an easily defended site at the head of the estuary, and at the point which, until modern times, was the limit of ocean navigation. Though the deepening of the channel now enables ocean liners to pass up the St. Lawrence to Montreal, the largest and fastest liners still make Quebec their summer terminus. Nearby waterfalls provide abundant hydro-electricity, and the city is one of the chief manufacturing centres of Canada.

Montreal is situated at the focus of the following routes:

1. The ocean highway and land routes of the St. Lawrence estuary.
2. The Ottawa River and valley.
3. The Upper St. Lawrence and the Great Lakes.
4. The Richelieu and Hudson valleys, leading to New York (see Fig. 95, p. 172). It has therefore become the largest city, the chief port, and the busiest manufacturing centre of Canada. About two-thirds of the people speak French, and the city is, indeed, second only to Paris among the French-speaking cities of the world.

Ottawa, the capital of Canada, is situated at the limit of navigation on the Ottawa River just below the Chaudière Falls, and where the main railways across Canada leave the Ottawa valley on their way to the prairies. To the north of Ottawa is the great lumbering region of Canada, and the city itself is an important centre for saw-milling and the manufacture of pulp and paper.

Kingston, situated on the eastern end of Lake Ontario, is only of minor importance as a port, as the Upper St. Lawrence is not navigable for large steamers.

The Lake Peninsula. This is the region between lakes Huron, Erie, and Ontario. Both agriculturally and industrially it is the most important region of Canada. Dairying, devoted chiefly to the production of cheese for the British

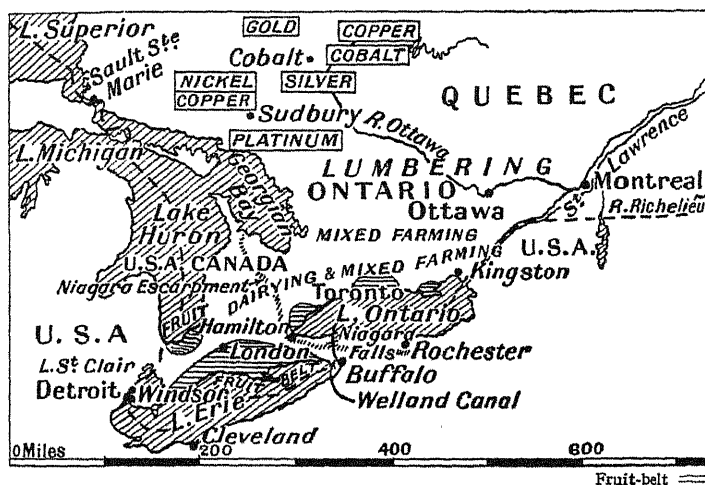


FIG. 85. THE LAKE PENINSULA

market, is the dominant type of farming, but large quantities of deciduous fruits (apples, pears, peaches) are grown on the Niagara fruit belt, which lies on the northern side of Lake Erie. The growth of industry has been encouraged by the abundant supplies of cheap hydro-electricity from Niagara and other falls.

Toronto, the capital of Ontario; *Hamilton*, situated at the western end of Lake Ontario; *Windsor*, at the eastern end of

Lake Erie; and *London*, situated midway between lakes Huron and Erie, are the chief manufacturing centres.

The Prairie Provinces. These provinces embrace not only the prairies, but also a large area of coniferous forest and of the Canadian shield. Formerly the haunt of huge herds of buffalo and of nomadic native Indians, the prairies are now the 'bread-basket' of the empire. Wheat-growing commenced

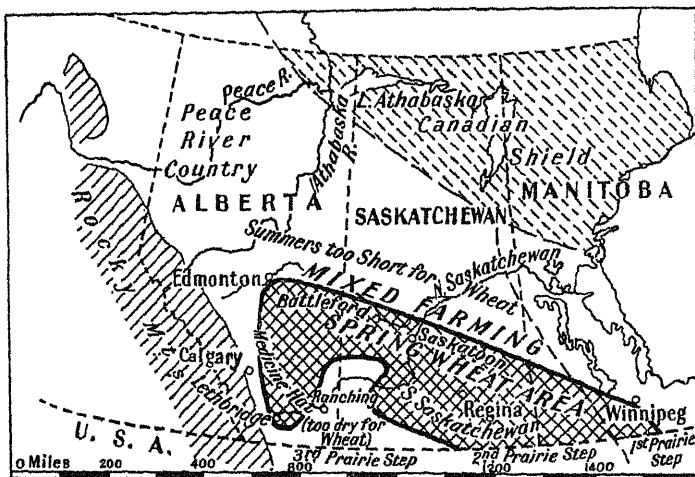


FIG. 86. THE PRAIRIE PROVINCES

on the alluvial plain of the Red River basin round Winnipeg, and spread rapidly westward and northward as the trans-continental railways were built, and as new varieties of wheat suitable to the dry climate and short summers were bred. The factors determining the present limits of the wheat belt are:

(a) *Rainfall.* Even by dry-farming methods wheat requires at least 12 inches of rain per year. Consequently the dry belt of South Alberta produces little wheat and is devoted chiefly to ranching.

(b) *Length of growing season.* The northern limit of the wheat belt is the line beyond which the growing period between spring thaw and autumn frost is not long enough for wheat to ripen. At present this limit corresponds roughly to the line of 110 frost-free days, but the wheat area is now being extended by the introduction of new types which ripen in only 100 days.

(c) *Soil fertility.* As wheat cannot be cultivated unless the

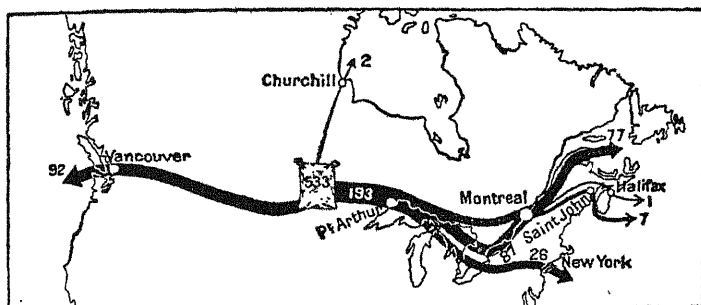


FIG. 87. TRANSPORT OF CANADIAN WHEAT

(Figures represent millions of bushels)

soil is deep and fertile, the wheat belt ceases at the western edge of the barren Canadian shield.

(d) *Elevation.* Wheat cultivation ceases at the foot of the Rockies, about the 3,000 feet line.

Transport of Canadian wheat. Canada's exports of wheat represent three-quarters of her total crop and 40 per cent of all the wheat which enters into world commerce. When the wheat is harvested it is stored in small elevators alongside the railway, and from there transported to the gigantic elevators at the ports. All the wheat which comes eastward from the prairies passes through Winnipeg, where it is carefully graded and then forwarded to the lake ports of Fort William and Port Arthur. From there most of it goes to Montreal, either by the

Canadian Pacific Railway or via the Great Lakes, the rest going via the Great Lakes to Buffalo and thence by rail to New York (see Fig. 87). A large part of the Canadian crop now goes westward from the prairies to the port of Vancouver. Some of this wheat is sent to China and Japan, but most of it goes through the Panama Canal to Europe. Small quantities of wheat are also sent via the small port of Churchill on Hudson Bay.

Minerals of the Prairies. In Alberta and western Saskatchewan there are great deposits of coal, but the field is as yet little worked. Petroleum is found in the Turner valley in Alberta, but here again the output is small. Natural gas, obtained from bores made when searching for oil, is used for street lighting in Medicine Hat and other places.

Cities of the Prairie Provinces. *Winnipeg*, situated at the confluence of the Assiniboine and Red Rivers, and near the centre of one of the most productive farming areas of North America, is the fourth largest city of Canada. As it is situated in the middle of the gateway between Lake Manitoba and the United States frontier it has become the focus of all the railways of the region. It is the market for the wheat of all the eastern half of the prairies, and it has excellent railway facilities. Nearby sources of hydro-electricity have encouraged the development of manufacturing industries.

Regina is the capital of Saskatchewan, and *Saskatoon*, on the Saskatchewan River, is a university centre and flour-milling town. *Edmonton*, the capital of Alberta, owes its rapid growth during the present century to the north-western extension of the wheat belt. To the north-west of the city is the Peace River Country, which, though formerly considered unsuitable for settlement, is now proving capable of great agricultural development. *Calgary* is situated at the foot of the Rockies between the wheat land and the semi-arid ranching land and near to the oil of the Turner valley.

The Canadian Shield. Though this area is too barren and cold for agriculture it is, nevertheless, of considerable economic value. The chief industries are:

1. *Mining.* The hard old rocks of the Canadian shield yield many minerals, the chief of which are gold, nickel, cobalt, zinc, and copper. The principal mining centre is Sudbury which produces 80 per cent of the world's nickel as well as much copper and platinum. Other centres, notable chiefly for the production of gold, are Porcupine, Red Lake, Flinflon, and Sherridon.

2. *Lumbering.* The southern portion of the Canadian shield is forested, but most of the original stands have been cut down. The second growth, however, still supplies enormous quantities of timber for wood pulp and paper.

3. *Hunting and Trapping.* Canada is, with the possible exception of Russia, the chief source of furs. Fur-bearing animals (musk-rat, beaver, and various types of fox) are trapped by Indians and half-breeds during the winter and brought to trading-posts in spring.

The Mackenzie Basin. Even in this barren region considerable economic development has taken place in recent years. In summer communication is maintained by steamers which navigate the rivers and lakes; in winter dog-sledges are used; and an air service is maintained throughout the year from railhead at Fort McMurray to the small port of Aklavik, near the mouth of the Mackenzie.

Gold, silver, and radium are produced near Great Slave Lake and Great Bear Lake, and herds of reindeer are grazed on the Arctic prairie of the Mackenzie delta.

The Hudson Bay Railway, which was completed in 1929, runs from The Pas in Manitoba, where it connects with older lines serving the prairies, to Churchill on Hudson Bay. It provides the shortest route from the prairies to Europe.

but as the Hudson Bay is closed by ice for nine months of the year the amount of freight carried by the line is as yet very small.

British Columbia. This mountainous province consists of six physical elements which comprise the Rocky Mountain system in this region.

1. The Rockies, which form a broad belt fifty to eighty miles wide, with peaks over 13,000 feet in height. The chief passes through the range are the Crow's Nest, Kicking Horse, Yellowhead, and Peace River Gap.

2. The Rocky Mountain trench, a deep valley to the west of the Rockies.

3. The Gold Ranges, which include the Caribou and Selkirk Mountains.

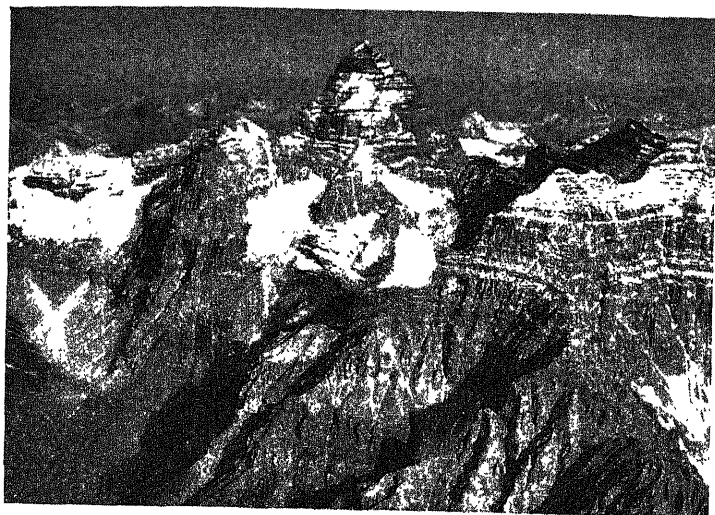
4. The British Columbia Plateau, which has an average elevation of 3,000 feet, but which is dissected by many deep canyons.

5. The Cascade Range on the west coast.

6. The drowned Coast Range which forms Vancouver Island, Queen Charlotte Island, and the archipelago further north.

The chief river is the Fraser, which rises in the Rockies, flows north along the Rocky Mountain trench, rounds the Gold Ranges, crosses the British Columbia plateau in a deep canyon, and enters the sea by a delta at New Westminster.

As British Columbia lies at the western side of the continent and in the same latitude as Britain, it has in the main a west European type of climate, with rain at all seasons from the westerly winds and depressions. The interior plateaus and valleys are, however, shut off from oceanic influences and have, therefore, a drier and more extreme climate than the coastal region. Indeed, in many of the deep valleys of the interior, agriculture is dependent on irrigation.



MT. ASSINIBOINE
Note the horizontal strata



MT. ISHBEL
Note the jagged peaks due to the highly inclined strata

High Commissioner for Canada

INDUSTRIES. (a) *Lumbering*. Extensive stands of large conifers exist on all the mountain ranges, and on account of the comparative mildness of the climate, lumbering can be

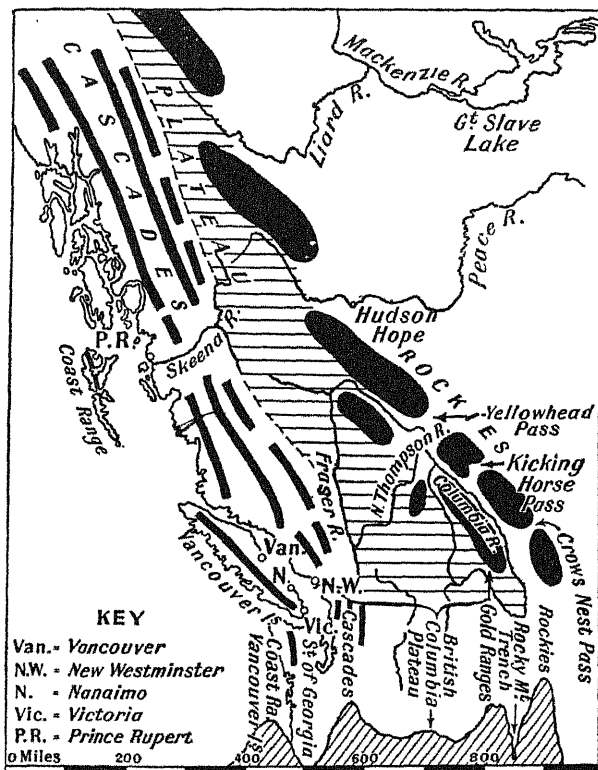


FIG. 88. BRITISH COLUMBIA

carried on throughout the year. The industry is directed chiefly to the production of timber for export, though the pulp and paper industries are also of considerable importance.

(b) *Mining*. British Columbia produces about 10 per cent

of the gold of the Dominion. Silver, lead, zinc, copper, and other metals are found in close proximity and are often produced in the same mine. Trail, near the United States border, is the chief smelting centre. Coal is mined near the Crow's Nest Pass and at Nanaimo on Vancouver Island.

(c) *Farming*. In the coastal region dairying and mixed farming predominate. In the interior valleys of the south, such as the Okanagan Valley, there are extensive apple and pear orchards irrigated by the mountain streams. On the plateau and in the Rocky Mountain trench ranching predominates.

(d) *Fishing*. The inlets and rivers of British Columbia form one of the world's chief fishing-grounds. Salmon, caught in summer when the fish come up the river to spawn, account for 80 per cent of the value of fish landed. Practically the whole of the catch is canned for export. Halibut is caught off the coast, packed in ice, and sent to the cities of central and eastern Canada. Whaling and sealing are also carried on.

TOWNS. *Vancouver* is Canada's chief outlet on the west. It is situated on the deep, sheltered, silt-free, ice-free harbour of Burrard Inlet. It is the terminus of two transcontinental railways, is accessible at all times by the largest ocean vessels, and has regular steamship services to other ports of western America, to Europe via the Panama Canal, and across the Pacific to China, Japan, and Australia. In recent years it has become the principal wheat port of Canada, dealing with nearly half of the total grain export. It is also the chief manufacturing centre of British Columbia, as it is the most convenient point for the assemblage of raw materials.

Prince Rupert, at the mouth of the Skeena River, is another ice-free port and terminus of a transcontinental railway. Its exports are chiefly local products, such as tinned salmon,

timber, and metals. *New Westminster*, situated on the Fraser delta, suffers as a port from the silting of the river channel, but is of considerable importance as a timber-working and manufacturing centre. *Victoria*, the capital of British Columbia, is a quiet residential city situated on the southern corner of Vancouver Island.

THE TRANSCONTINENTAL RAILWAYS OF CANADA

The Canadian Pacific Railway runs from Montreal to Vancouver, a distance of nearly 3,000 miles, but branches and 'additional lines,' such as those linking Montreal with Quebec and Saint John, bring the total mileage owned by the company up to 12,000. The Canadian Pacific Railway is still privately owned, but nearly all the other railways of Canada are now owned by the State and grouped under one system known as the Canadian National Railways. They provide two transcontinental routes, the terminal ports being Halifax and Saint John on the east coast and Prince Rupert and Vancouver on the west coast.

CHAPTER IX

NORTH AMERICA (*continued*)

THE UNITED STATES

LONGITUDE 100° W. divides the United States into two halves which present great geographical contrasts. The western half is mountainous and on the whole arid and thinly peopled, whereas the eastern half has comparatively little highland, receives adequate rainfall all the year round, and is a highly developed farming and manufacturing region.

A. THE WESTERN HALF

I. THE PACIFIC BORDERLANDS

This is the region between the west coast and the crest of the range which is called the Cascades in Canada and the Sierra Nevada in the United States. Physically and climatically it is divisible into two parts by the boundary between the states of Oregon and California. The northern portion, in the states of Washington and Oregon, consists of a 'U' of high land and a broad valley between the limbs of the 'U.' At its northern end this valley leads into Puget Sound, while the western limb of the 'U' is broken by the mouth of the Columbia River. As this region lies north of 40° N. it is in the belt of westerly winds, and so has a mild, moist, west European type of climate. The chief industries are mixed farming, fruit-growing, and lumbering. *Seattle* and *Tacoma* are ports on Puget Sound, and *Portland*, at the head of ocean

navigation of the Columbia River, is one of the most important ports of the west coast of America.

The state of California, which forms the southern portion

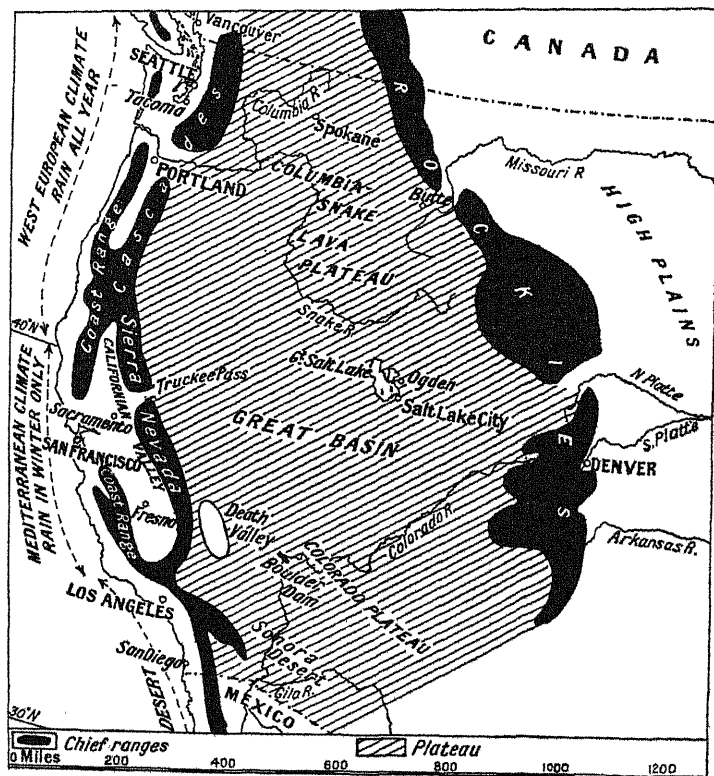


FIG. 89. WESTERN UNITED STATES

of the region, consists of an elongated oval of high land, formed by the Coast Range, Cascade Range, and the Sierra Nevada, and a long valley enclosed by the high land. This

valley is drained by the rivers Sacramento and San Joachin, whose combined waters flow to the Pacific via the great break known as the Golden Gate.

As California lies on the west of its continent, between latitudes 30° N. and 40° N. it has a Mediterranean type of climate, with warm, moist, sunny winters and hot, dry summers. As in British Columbia, however, the interior is partially shut off by the mountains from the oceanic influences, and the central valley has a rather dry and extreme climate. In the northern half of the valley irrigation is desirable for most crops, and in the southern half it is absolutely essential. Fortunately, numerous streams from the Cascade Range and the Sierra Nevada supply abundant water for irrigation.

Agriculture. The dominant industry of California is fruit-growing, and peaches, prunes, raisins, apples, etc., are sent in tremendous quantities to eastern U.S.A. and to Europe. Wheat is grown in the northern half of the central valley and sheep are reared on the lower slopes of the mountains.

In the northern half of the state the mountains are clothed with stands of huge coniferous trees, such as the giant redwood, and lumbering is an important industry.

Mining. The first extensive peopling of California by Europeans was due to the discovery of gold in 1849, and the state is still the leading producer of gold in the U.S.A. Of much greater importance, however, is petroleum, which is obtained from one of the world's most productive oil-fields, situated near Los Angeles.

San Francisco owes its importance chiefly to its advantages of position. It is situated on the Golden Gate, which is the only break in the Coast Range, it is immediately opposite the Truckee Pass in the Sierra Nevada, through which one of the chief transcontinental railways runs, and it is at the focus of routes from the Californian Valley and the coastal regions.

As a port it is concerned primarily with China and Japan, and with the Pacific coasts of America, though the opening of the Panama Canal has put it within easy reach of eastern America and Europe.

Los Angeles, with its numerous suburbs, now ranks as the largest city in California. The above-mentioned oil-field, together with abundant supplies of hydro-electricity, have helped to make it one of the principal manufacturing cities of the United States. Its ports, San Pedro and Long Beach, some eighteen miles from the city itself, are concerned chiefly with the export of petroleum. The cinema industry of Hollywood owes its rise largely to the dry, sunny climate, and to the proximity of magnificent mountain and desert scenery.

Other important cities of California are Sacramento, the capital of the state; San Bernadino, noted for 'Sun Maid' raisins; and San Diego, a naval station and port near the Mexican border.

II. THE INTERIOR PLATEAUS

The region between the Sierra Nevada and the Rockies consists of wide plateaus, separated by high mountain ranges. The plateaus suffer from lack of rain, since they are in the rain shadow of the surrounding mountains. Consequently the chief industry of the region is ranching. There are, however, many irrigated oases, of which the most notable are Salt Lake City in Utah, the Spokane district of Oregon, and the Imperial Valley in the lower Colorado basin.

Veins of mineral ores occur in many districts and considerable quantities of gold, silver, copper, lead, and zinc are produced. Among the chief mining and smelting towns are Butte in Montana and Denver in Colorado.

III. THE HIGH PLAINS

This region lies between the Rockies and the escarpment known as the 'Break of the Plains,' which roughly follows longitude 100° W. Though as on the wheat lands of Canada the rainfall varies from 12 inches at the foot of the Rockies to about 20 inches at the Break of the Plains, the summers are so hot that crops cannot be grown with certainty. Consequently the region is in the main given up chiefly to ranching, though there are also many small irrigated areas of arable land and some grain is produced by dry-farming methods.

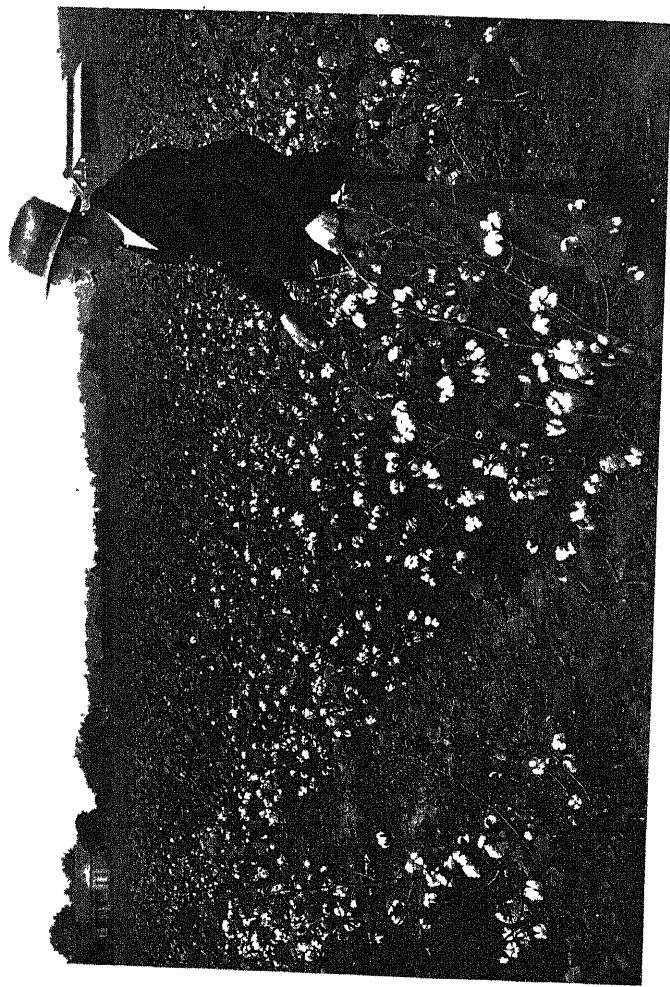
B. THE EASTERN HALF OF THE U.S.A.

To the east of 100° W. the land is, in general, sufficiently fertile, and the rainfall sufficiently great for the cultivation of crops, but as both rainfall and winter temperature increase from north to south the region is divisible in parallel belts, each distinguished by a dominant crop (see Fig. 90).

(a) The *spring wheat belt* is a continuation of the spring wheat belt of the Canadian prairie, and methods of cultivation are very similar to those in Canada, though there is less need for quick-ripening types of grain.

(b) The *corn belt*, or maize belt, has heavier rainfall, higher temperatures, and a longer growing season than the spring wheat belt. About half the land in the region is sown with corn (maize), which is rotated with winter wheat and clover. The maize is nearly all fed to cattle and pigs, which are sold to the great meat factories in Chicago, St. Louis, Kansas, and other states of the central lowland.

Tobacco is the chief money crop in certain parts of the corn belt, especially in Virginia and Kentucky, which produce most of the tobacco which enters into world commerce.



COTTON FIELD, GEORGIA

Mondiale

(c) The *cotton belt* produces nearly half the world's cotton. The area has more than 7 months free from frost and more than 23 inches of rain. In the older cotton lands in the east most of the crop is produced by small farmers, both white and negro. Many of these are poor share-croppers who pay as rent to the land-owner an agreed proportion of the total crop. In Texas, however, the farms are larger and much mach-

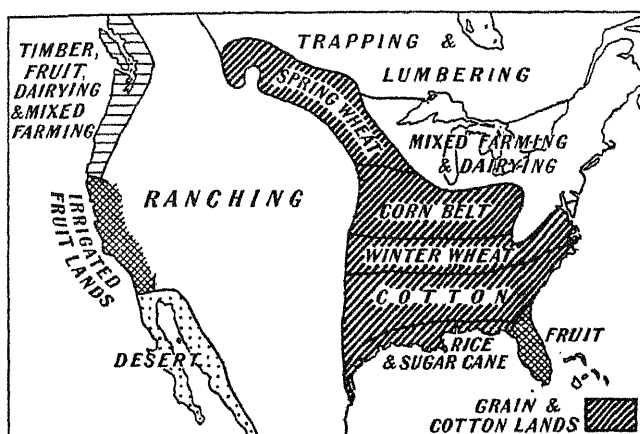


FIG. 90. UTILIZATION OF LAND

inery is used. Consequently, the industry is more prosperous in this region and is rapidly expanding at the expense of the eastern area, where the farmers are being compelled to devote much former cotton land to beans, maize, ground-nuts, and soya beans.

(d) The *rice and sugar belt* lies on the coastal plain south of the cotton belt, where there is sufficient water to flood the land. In the production of both rice and sugar much labour-saving machinery is used, but this does not quite balance the comparatively high cost of labour, and tariffs on imported sugar and rice are necessary for the maintenance of the home industry.

FLORIDA

This peninsula is composed mainly of low-lying limestone and the greater part of it is covered with forests and swamp, such as the Everglades and the Cypress Swamps. The coastal plains, however, have much fertile soil and this fact, together with the mild, moist, equable climate, abundant sunshine, and frequent showers at all seasons, has encouraged the development of fruit-growing and market gardening. The chief fruits produced are oranges, grape-fruit, and limes. On the eastern coast of Florida are many famous winter resorts, such as Palm Beach and Daytona Beach. From the southern tip of the peninsula the Key West railway runs across a line of 'keys,' or coral reefs, to the port and naval station of Key West.

MINERALS OF THE EASTERN HALF

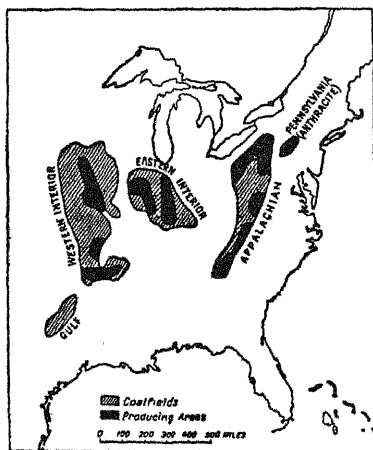


FIG. 91. COAL-FIELDS OF CENTRAL AND EASTERN U.S.A.

1. *Coal.* The chief coal-field of the United States, and indeed of the world, is the Appalachian field, which extends for 800 miles from northern Pennsylvania to central Alabama. Its output represents two-thirds of the total for the United States and about a quarter of the world's total. The chief mining areas are Pennsylvania (around Pittsburgh), West Virginia, and central Alabama (around

Birmingham). Of the other coal-fields shown in Fig. 91, the chief is the Eastern Interior Field, which produces about one-fifth of the country's total output.

2. *Iron.* The most productive iron-field of the world lies around the western end of Lake Superior. Most of the ore is sent down the Great Lakes to Cleveland and thence to the

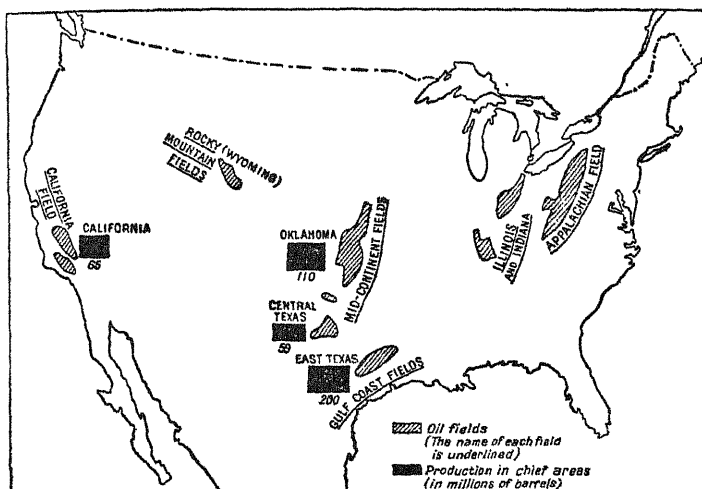


FIG. 92. OIL-FIELDS OF THE U.S.A.

Pittsburgh district for smelting. Much iron ore is also mined and smelted in the Birmingham district.

3. *Petroleum.* The distribution of the oil-fields is shown in Fig. 92. The Appalachian field, which was the first to be developed, is almost exhausted and the chief producing states are now Texas and Oklahoma. From these fields the oil is conveyed by pipe-line to the south coast, where it is refined and exported.

Lead and zinc are mined in the Ozark Plateau in north-

western Arkansas. Sulphur is obtained on the coastal plain near Galveston by making deep bore holes, forcing steam and hot water down them, and pumping up the liquefied sulphur. Phosphate rock, used in the manufacturing of fertilizers, is obtained in central and northern Florida.

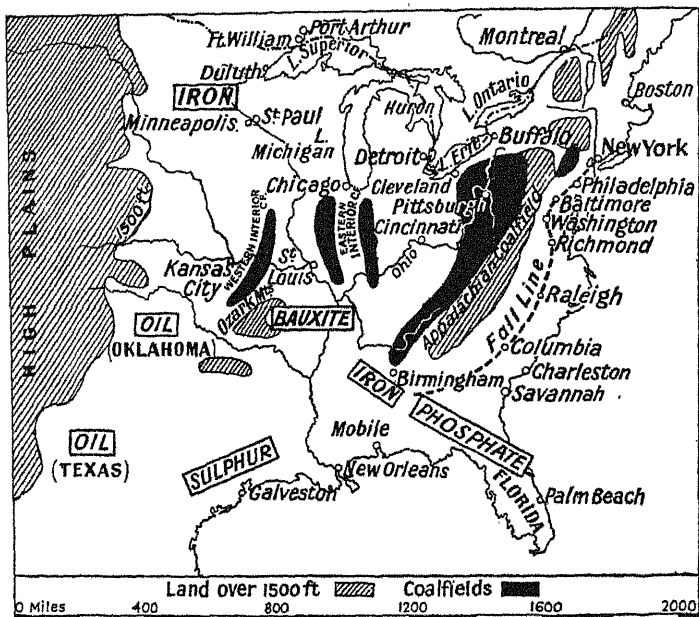


FIG. 93. EASTERN U.S.A.—PHYSICAL, TOWNS, AND MINERALS

THE CITIES OF THE MISSISSIPPI LOWLANDS

Though inland water transport is now of comparatively little importance in the United States, the sites of most of the large cities of the Mississippi basin are closely related to the facilities for navigation and for crossing the river. Thus the twin cities of *Minneapolis* and *St. Paul* have grown up at the

head of navigation of the Mississippi, and at a suitable crossing place of the river immediately below the St. Antony Falls. *Cincinnati* is situated at a great bend on the river Ohio, where the pioneer trail which followed the upper valley left it on its way westward; *Kansas City* is at the point where the trails diverged from the Missouri River; *St. Louis* is near the confluence of the Mississippi and the Missouri and at the point where the pioneer trails from east to west crossed the river; it was also the limit of navigation for the large steamers which plied the lower course of the Mississippi, and in modern times it has become the chief railway centre of the Mississippi lowlands. *New Orleans* is situated on the Mississippi delta 200 miles from the mouth. It is the third port of the United States and is specially concerned with the export of cotton, rice, wheat, and timber. Galveston, Houston, Mobile, and Savannah are other cotton ports.

THE INDUSTRIAL NORTH-EAST

Examination of a population map shows the following facts: (a) Nearly all the people of the United States live in the half east of longitude 100° W., which roughly coincides with the line of 20 inches annual rainfall.

(b) The north-eastern quadrant is the only really densely peopled part of the country.

(c) Within this quadrant is a rectangle 500 miles by 300 miles which contains most of the large towns and all the large areas with over 512 people per square mile, and which conducts two-thirds of the manufacturing of the United States. This industrial region of the north-east differs from those of western Europe in that it produces little coal, little iron, and few of the raw materials required for manufacture. It was, however, the first area to be closely settled, the first to develop

domestic industries, and the only area having close contact with Europe. As the country developed, the early domestic industries continued to grow in the centres in which they had first been established and drew to them supplies of coal, metals, and other raw materials from various parts of the country.

The iron and steel industry. This centres chiefly around Pittsburgh where local iron and coal occur in close proximity. The local iron, however, is not now worked, iron ore being brought in from the head of Lake Superior. Coke is sent as return cargo to Cleveland and to Duluth at the head of Lake Superior. At these two ports, therefore, the streams of iron and coke meet, and as a result iron and steel industries have developed there also. Duluth is, however, handicapped by lack of local markets, and in spite of its proximity to the iron and the cheapness of coal brought as return cargo, the industry does not flourish. Another great centre of the iron and steel industry is Fort Gary, near Chicago, which is situated almost midway between the iron of Lake Superior and the coal of Pittsburgh.

The textile industries. The chief area for the manufacturing of cotton goods and woollen goods is the coastal region of the New England States. This region has, however, suffered considerably in recent years by the competition of factories established in the Southern States where labour costs are much lower. The chief cotton-manufacturing centres are Lowell and Manchester in the Merrimac Valley, and New Bedford and Fall River near the south coast. The woollen industry is centred chiefly at Lowell, Lawrence, and Manchester.

Great Cities of the North-East. *Duluth* is the western terminus of the Great Lakes route, and the port from which wheat from the spring wheat belt is shipped. Its chief industry is the manufacture of agricultural implements for the mechanized farms of the great plains. *Chicago*, with a population

of nearly $3\frac{1}{2}$ million, is the second largest city of America. The factors which help account for its rapid growth are:

1. Its situation on a good harbour at the southern end of Lake Michigan.
2. The convergence of railways from east, south, and west.
3. The prosperity of the maize belt and the Middle West in general, which supplies animals for the great stock-yards.

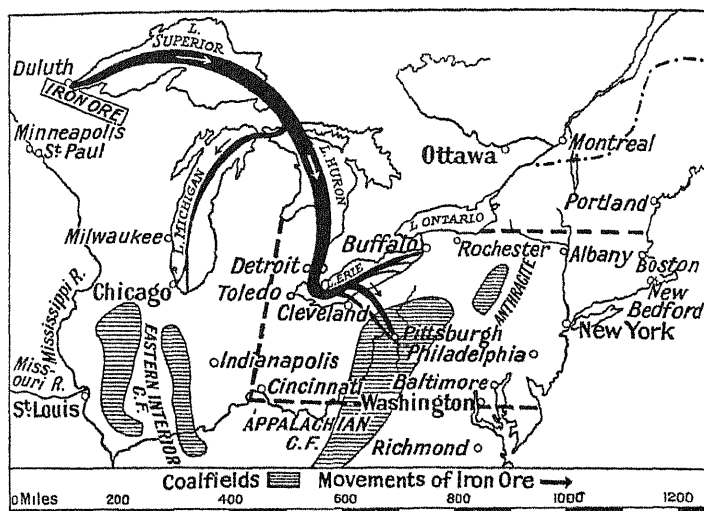


FIG. 94. NORTH-EASTERN U.S.A.

Two-thirds of the manufacturing of U.S.A. is carried on within the area marked thus - - -

Detroit, situated where the land route from the Lake Peninsula of Canada crosses the Great Lakes waterway, ranks next to New York and Chicago in the value of its industrial output. It is the world's largest centre for the manufacture of motor cars. *Cleveland*, the chief city on the southern shore

of Lake Erie, is specially concerned with the trans-shipment of iron ore from the Great Lakes to Pittsburgh, and with the smelting of iron and the manufacture of iron and steel goods. *Buffalo*, situated at the eastern end of Lake Erie, is one of the greatest inland ports of the world. The ease of assemblage



FIG. 95. NEW YORK AND NEW ENGLAND

of raw materials such as wheat, timber, and metals, and the abundance of cheap hydro-electricity generated at nearby falls, have enabled it to develop great industries. *Rochester*, on Lake Ontario, is comparable in position to Cleveland on Lake Erie. It is notable chiefly for the manufacture of Kodak cameras, lenses, and photographic materials. *Albany* is situated on the Hudson-Mohawk Gap which leads from New York to the Great Lakes. In recent years the Hudson River

has been deepened to enable large ocean vessels to reach Albany, which has therefore developed rapidly as an ocean port. *Boston* is the chief city of the New England region and one of the leading ports and manufacturing centres of the United States. It developed earlier than New York, but had the disadvantage of being cut off from the interior by mountain ranges. Though it is now connected by rail to the Hudson Valley it has never been able to compete with New York as a port and now ranks only as seventh port in the country. It is particularly noted as a market for wool, leather, hides, and chemicals.

New York, the second largest city of the world, is situated at the mouth of the Hudson River. Its harbour is ice-free and consists of five tidal highways connected to the open sea by deep sheltered channels. The 'funnel' of the Hudson-Mohawk trough draws to it food-stuffs, raw materials, and manufactured goods from all the industrial north-east, and the abundance of labour, the ease with which raw materials can be assembled, and the ready access to markets both at home and abroad, have enabled it to become the chief centre for manufacturing of the United States.

Philadelphia and *Baltimore* are situated where the Fall Line cuts the heads of Delaware Bay and Chesapeake Bay respectively. Both are important ports and manufacturing cities, the former being noted chiefly for ship-building, textiles, and sugar-refining, the latter for iron and steel and clothing.

Washington, the capital of the United States, is situated at the head of navigation on the Potomac River. The district which it occupies is a separate state known as the District of Columbia, and the city is generally known as Washington, D.C., to distinguish it from the state of Washington and from other cities of that name.

ALASKA

This mountainous peninsula is five times the size of the British Isles, but has a population of only 55,000. It was bought from Russia by U.S.A. in 1867 at a cost of £1,400,000, though it was then considered to be almost worthless economically. Since then gold to the value of £100,000,000 has been

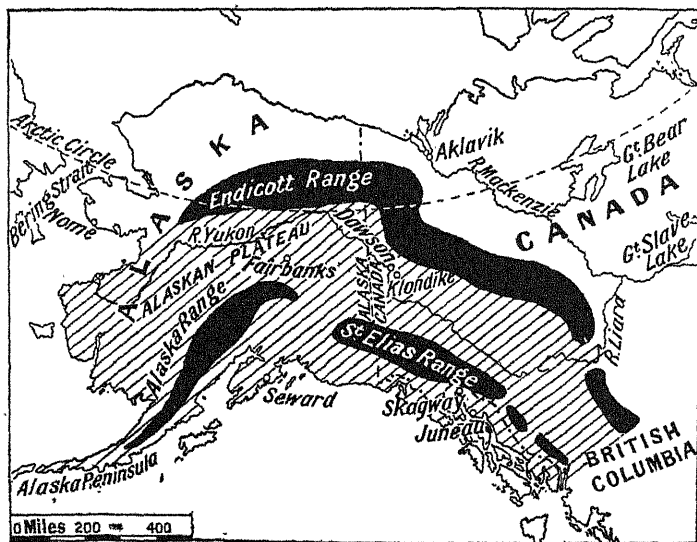


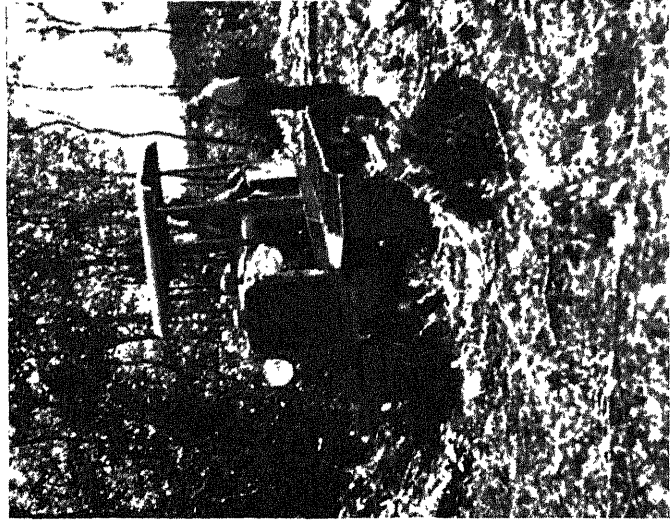
FIG. 96. ALASKA

extracted, and there are still large reserves of this metal as well as deposits of copper and coal, and rich forests, reindeer pastures, and fisheries.

Most of the peninsula lies south of the Arctic Circle, and the climate is somewhat similar to that of Scandinavia. The mountainous coastal region has mild winters and cool summers, like the Norwegian coast, but the interior has a continental



A. G. Buckham
MOUNTAIN RANGES BETWEEN TAMPICO AND
MEXICO CITY



War Resister's International
LAND CLEARING ON A EUROPEAN REFUGEE
SETTLEMENT AT PITAL, COLOMBIA

climate with long, cold winters and warm summers with only 10 to 15 inches of rain. The Tundra region of the extreme north is suitable only for the pasturing of reindeer.

Salmon fishing is the most important industry, more than half the world's tinned salmon coming from Alaskan waters. Gold mining is carried on chiefly at Nome and Fairbanks in the basin of the Yukon, and at Juneau on the south coast. Copper is mined on the Copper River which flows to the Pacific coast. Reindeer were introduced in the late-nineteenth century, and the herds now number nearly one million.

The capital of Alaska is *Juneau*, situated at the southern end of the fiord known as the Lynn Canal.

MEXICO

Mexico was a Spanish colony until 1821 when the people rebelled and established their independence. It is a land of great physical and climatic variety, and may be divided into the following natural regions.

1. The Californian Peninsula which is formed by an extension of the coast range of California. It is almost absolute desert.

2. The Sonora Desert to the east of the Gulf of California.

3. The Western Sierra Madre which is a continuation of Sierra Nevada of California.

4. The Northern Plateau which has an average of elevation of 5,000 feet and consists of flat-bottomed basins separated by low mountain ranges. The climate is rather dry as the plateau is in the rain shadow of its border ranges. Ranching is, therefore, the chief industry. Certain parts of the plateau are rich in minerals, notably Durango where there is a famous hill of iron, and Salinas where the only coal-field of Mexico is situated.

5. The Eastern Sierra Madre which receives much rain from the north of Mexico, and is, therefore, densely forested.

6. The Eastern Coastal Plain on the shores of the Gulf of Mexico. Here, around Tuxpan and Tampico, is situated an important oil-field which supplies about 3 per cent of the world's petroleum.

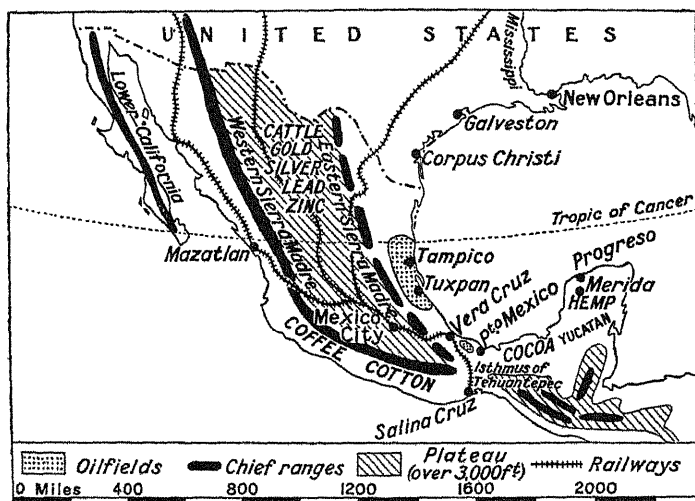


FIG. 97. MEXICO

7. The Southern Highlands, which are isolated from the rest of Mexico, because of the difficulty of the construction of roads and railways.

8. Yucatan, a low peninsula composed largely of limestone. Here the chief industry is the cultivation and preparation of sisal-hemp. *Merida*, the capital and commercial centre of Yucatan, and *Progreso*, the chief port, are concerned chiefly in the marketing of sisal.

CHAPTER X

CENTRAL AND SOUTH AMERICA

CENTRAL AMERICA

CENTRAL America is the region between the southern boundary of Mexico and the northern boundary of Colombia. Though this area is only twice that of the British Isles it contains seven out of the twenty-three countries which make up the mainland of the continent.

Two separate mountain systems may be distinguished within the isthmus. North of the depression which crosses Nicaragua is a triple range of great complexity, which forms an undoubted link with North America. In the south is a single range which forms the backbone of the isthmus and comprises a link with the Andean system. Generally speaking the land rises very gradually from the Caribbean coast, while on the Pacific coast the slope is much more abrupt. In the interior are extensive intermontane plateaus which are the most suitable areas for human occupation.

The great majority of the inhabitants of Central America are of Indian descent, but there is a large admixture of European blood and the degree of purity of race varies considerably in different states. In Guatemala, for instance, nearly all the people are pure-blooded Indians, whilst in Costa Rica the whites predominate. In some districts the natives cultivate their own plots of land, but in others they are practically serfs compelled to work on the large estates.

COMMERCIAL PRODUCTS

Bananas. The Caribbean coast line of South America is the world's chief source of bananas. There is little difference in temperature either between summer or winter, or between day and night. The air is always moist and the rainfall is from 60 inches to 120 inches. Moreover, as the plantations



FIG. 98. THE WEST INDIES

are always situated near the coast, transport to the markets in U.S.A. and Britain is cheap.

Honduras produces more bananas than any other country in the world and Guatemala, Costa Rica, Panama, and Nicaragua also produce large quantities.

Coffee is the chief money crop, especially in those areas where there is deep fertile volcanic soil. Though production is only small in comparison with that of Brazil, the quality is high and the price it commands in the world's markets is sufficient to pay the high cost of transport over difficult trails

to the coast. The chief producing states are Guatemala, Salvador, and Costa Rica.

Chicle, the raw material from which chewing-gum is made, is a sticky juice obtained from a certain evergreen tree by making spiral grooves in the trunk. A large part of the world's supplies are obtained from the forests of British Honduras and Guatemala.

Timber. The only important source of timber in Central America is British Honduras, which yields mahogany and log wood.

STATES AND TOWNS

Guatemala is the most productive of the republics of South America. The northern half, however, is a dense tropical forest, and though it was the home of the former Maya civilization it is now little cultivated and of little importance except for chicle. In the south the fertile volcanic soil of the highlands favours the cultivation of coffee, while the coastal plains have already been noted as the world's chief source of bananas. The capital is *Guatemala City*.

British Honduras is a little larger than Wales and is the most thinly peopled state of South America. *Belize*, the capital, and *Stann Creek* are the only towns.

Honduras, though rich in minerals, is entirely undeveloped except for the banana belt on the Caribbean coast. The capital is *Tegucigalpa*.

Salvador is the smallest and most densely peopled of the Central American republics. Agricultural production is almost entirely in the hands of the natives, and an excellent system of transport has been developed. The capital, *San Salvador*, is situated some 25 miles from the coast, and is connected by rail to the outport *La Libertad*.

Nicaragua is notable chiefly for the great depression which

crosses the country from the Caribbean to the Pacific coast. It is quite possible that in the future this depression may be utilized for the construction of a ship canal to supplement the Panama Canal. *Managua*, the capital, is situated in this central trough.

Costa Rica is noted for its large proportion of white inhabitants and for its production of coffee and bananas. *San José*, the capital, is situated on the plateau, and is connected by rail to *Limon*, its port on the Caribbean.

Panama is a small republic through which runs the Panama Canal zone, a belt of territory owned by the U.S.A.

The Panama Canal was opened for traffic in 1914. The north-western or Caribbean terminus is *Cristobal*, which is only a short distance from the ancient port of *Colon*, while the south-eastern terminus is *Balboa*, a modern extension of *Panama City*.

THE WEST INDIES

As shown in Fig. 98 the West Indies consist of an arc of islands linking South America with Central America. The islands are divided into Greater and Lesser Antilles, the former comprising the large islands of Cuba, Haiti, Porto Rico, and Jamaica, while the latter include the arc of small islands between Porto Rico and Trinidad.

Cuba, the largest island of the West Indies, is nominally an independent state, but is largely under the control of the U.S.A. It is the world's chief source of cane sugar (see p. 58). Tobacco ranks next to sugar in value of exports. The fine quality leaves used in the manufacture of cigars are grown on the large estates owned by Americans, whilst ordinary quality tobacco leaves are produced on small holdings of the natives.

Fruit-growing is another important branch of farming the

chief products being pineapples, grape-fruit, and bananas. Some iron ore is mined.

Havana, on a deep land-locked harbour near the north-west corner, is the capital and chief port.

Haiti. The Island of Haiti (*Hispaniola*) consists of two republics—Haiti in the west and Santo Domingo in the east. Both are nominally independent, but in practice are to a large extent controlled by U.S.A.

The republic of Haiti, which occupies the western part of the island, has been developed by American capital and produces considerable quantities of coffee, sugar, cotton, tobacco, and cocoa. The population is predominantly negro.

Port au Prince is the capital and chief port.

Santo Domingo, also known as the Dominican Republic, is less highly developed than the Republic of Haiti, though the soil is more fertile. The majority of the population are of mixed race, negro blood predominating.

Santo Domingo, recently renamed *Trujillo City*, is the capital.

Porto Rico is definitely an American possession and is the most productive and most densely peopled of the islands which compose the Greater Antilles. Sugar cane, tobacco, coffee, and tropical fruits are the chief products.

San Juan is the capital and chief port.

Jamaica has been a British possession since 1655, when it was taken from the Spanish by a force sent out by Cromwell.

The vast majority of the people are descendants of negro slaves who were brought from Africa in the seventeenth and eighteenth centuries to work on sugar plantations. Sugar cane and coffee are the chief commercial crops, but small quantities of ginger, cocoa, and honey are also produced. *Kingston*, the capital, is situated on a fine harbour on the southern side of the island.

THE LESSER ANTILLES

These islands are usually divided into the Leeward Islands in the north and the Windward Islands in the south, but the more useful division from the geographical point of view is that based on the type of rock. The inner portion of the arc including Grenada, St. Vincent, and Dominica, and the western half of Guadeloupe is composed of volcanic rock, while the outer arc, including Trinidad, Barbados, and Barbudac is composed of coral limestone.

Most of the islands are under British rule, but the U.S.A. govern part of the Virgin Islands, and France governs Guadeloupe, Martinique, and several smaller islands.

Trinidad is physically part of South America, though politically it is part of the British West Indies. Economically it is a highly developed island. Cocoa, sugar cane, and coconuts are the chief crops, while some coffee, lemons, and oranges are also produced.

Pitch. The famous pitch lake of Trinidad, which is the chief source of the world's natural asphalt, is situated in the south-western corner of the island. The lake has an area of over 100 acres, and a probable depth of 200 feet. As the pitch is taken out the holes gradually fill up, and it is estimated that at the present rate of working supplies will last for 400 years. Petroleum is obtained from wells near the pitch lake. Trinidad is the chief source of petroleum in the British Empire, but the output is less than 1 per cent of the world's total.

Port of Spain, situated near the north-western corner of the island, is the capital and chief port.

In the Leeward and Windward Islands the native inhabitants are engaged principally in the production of sugar, Sea Island cotton, and cocoa.

Dominica and Montserrat produce lemons, Martinique

specializes in the production of arrowroot, and **Grenada** in nutmeg.

The **Bahamas** are coral islands which rise from a submarine shelf running from Haiti towards Florida. Of the 3,000 islands only 29 are inhabited. The chief industry is the collection of sponges which are hooked up from the bed of the lagoons within the coral reefs. Fruit and early vegetables are raised for the American market. *Nassau* is the capital and chief port.

The **Bermudas**. This small group of coral islands, though not part of the West Indies, may most conveniently be mentioned here. The mild, sunny climate attracts many tourists and holiday-makers, and the islands are likely to be of great importance in the future as a stepping-stone on transatlantic air-routes.

SOUTH AMERICA

GENERAL SURVEY

The South American continent is a great triangular land-mass measuring 4,500 miles in length, and 3,200 miles at its greatest breadth. Like Africa it lies across the Equator, but it should be noted that while nearly two-thirds of Africa lies north of the Equator, only about one-eighth of South America is in the northern hemisphere.

From the physical point of view South America is the simplest of the continents, for it consists of three areas of highland separated by three lowland areas. The highlands are:

1. The fold mountain system of the Andes.
2. The tilted block of the Brazilian plateau.
3. The Guiana highlands.

The lowland regions are:

1. The Orinoco basin, between the Guiana highlands and the Andes.
2. The Amazon basin, between the Guiana highlands and the Brazilian plateau.

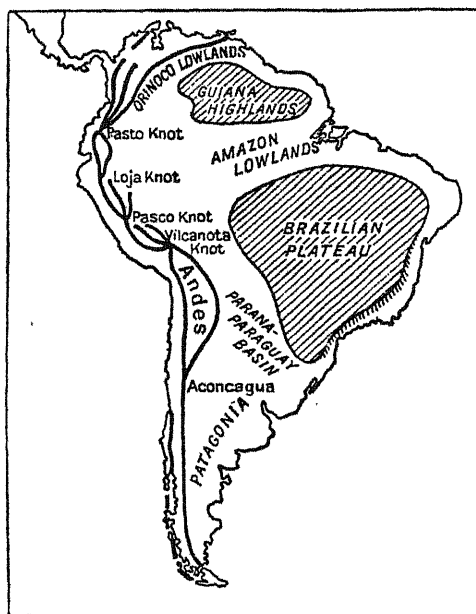


FIG. 99. S. AMERICA—STRUCTURE

3. The Parana-Paraguay lowlands between the Brazilian plateau and the Andes. This lowland is continued southward by the low plateau of Patagonia.

Climatically, South America is the most equable of the continents, the range of temperature rarely exceeding 20° F. The causes of this equability of climate are the position and

shape of the continent. The great bulk of its triangular mass lies within the Tropics, where the small variation in length of day and in the elevation of the midday sun cause little

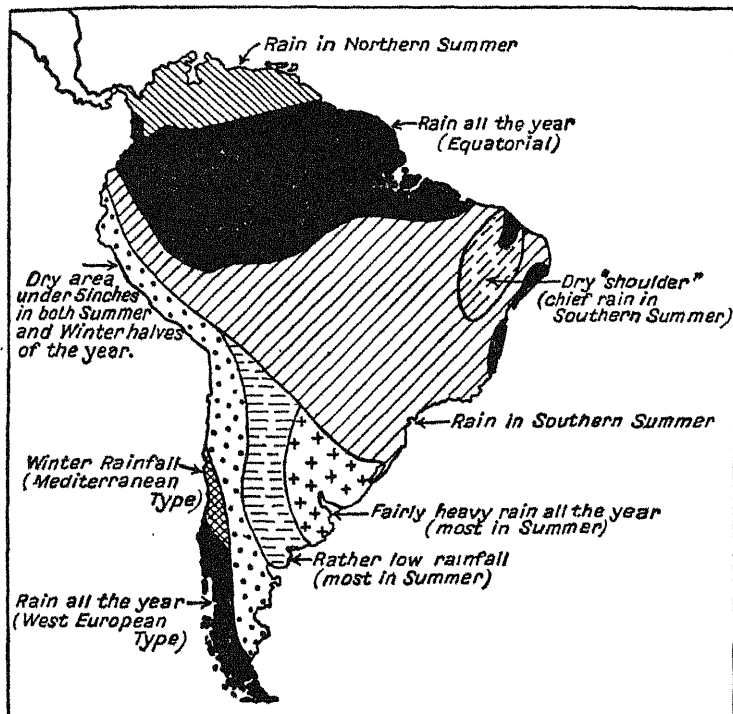


FIG. 100. S. AMERICA—RAINFALL

temperature differences between summer and winter; and the southward tapering of the continent means that in temperate latitudes, where the amount of heat received from the sun is much less in summer than in winter, no part of the continent is far removed from the equalizing influences of the sea.

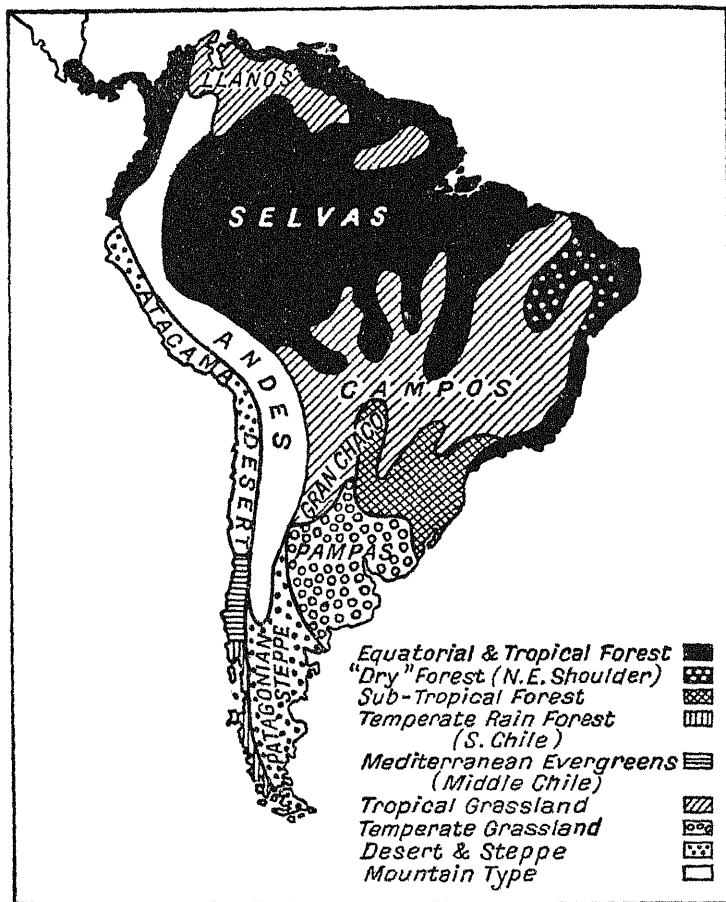


FIG. 101. S. AMERICA—VEGETATION

The climatic and vegetation divisions of South America are very similar to those of Africa (see Fig. 100). Thus the equatorial region of the Amazon basin corresponds to the equatorial region of West Africa and the Congo basin; the llanos, or tropical grasslands, of the Orinoco basin, correspond to the Sudanese savannah lands; and the campos, or savannahs, of the Brazilian plateau are the counterpart of those of Angola and Rhodesia; on the west coast of South America the Atacama Desert corresponds to the Kalahari Desert of South Africa, and the Mediterranean region of Middle Chile corresponds to that around Capetown; and on the east coast the tropical forest region north of Rio de Janeiro is similar to the east coast-lands of Africa south of the Equator.

The following differences should, however, be noted.

1. The area of equatorial climate of the Amazon lowlands extends only to the *east* coast, whereas the corresponding equatorial region of Africa extends only to the *west* coast. The reason for this difference is that the high land of South America (the Andes) is situated near the west coast, while the high land of equatorial Africa (the East African plateau) is situated near the east coast.

2. South America extends to latitude 56° S.; consequently Southern Chile has a west European type of climate, which has no counterpart in Africa.

3. For the above reason Patagonia, in the westerly wind belt, but in the rain-shadow of the Andes, has no counterpart in Africa.

4. The Atacama or Chile-Peru Desert extends northward almost to the Equator. The reason for this is the cold Humbolt current which so cools the air over it that even winds from the sea carry no moisture to the coast-lands.

5. The Andean region, with its great intermontane plateaus,

where the average temperature of each month differs little from that of an English spring, is paralleled in Africa only by the comparatively small plateaus of equatorial East Africa.

HISTORY AND PEOPLE

After the first discovery of America by Columbus in 1492, exploration of Central and South America proceeded rapidly, and by 1520, when Magellan sailed through the straits which bear his name, practically the whole coast was known, though vaguely, to Europeans. In 1531, Pizarro, with an army of 180 men, conquered the ancient empire of the Incas, and so established Spanish claims to the western half of the continent. Portugal, however, claimed a share of the newly discovered lands, as in 1494 an agreement had been signed whereby the eastern shoulder of the continent became Portuguese territory. The Spanish territories rebelled against the home government early in the nineteenth century, and established themselves as separate republics—Venezuela, Colombia, Ecuador, Peru, Bolivia, Chile, Argentina, Paraguay, and Uruguay. The Portuguese territories had, however, developed a greater degree of unity than those of Spain, and in 1815 the King of Portugal, driven from his throne by Napoleon, set up his throne at Rio de Janeiro. Seven years later Brazil gained its independence, but until it became a republic in 1889 it was an empire ruled by members of the Portuguese royal family. Thus it did not break into separate states like the Spanish territory, but became a union of states, whose full title is the United States of Brazil.

The great majority of the people of South America are Indians, but there are also large numbers of half-breeds, and a small ruling class of pure Spanish or Portuguese blood. In Brazil there is a large negro element, descended from slaves

imported to work on sugar plantations, and in British Guiana there are many East Indians who were brought over as free labourers to work on the sugar plantations.

In modern times many Italian, Portuguese, and Spanish immigrants have gone to Brazil, Argentina, and Chile, and there are fairly large settlements of Germans in southern Brazil, and a group of Welsh settlers in southern Argentina.

BRAZIL

This vast country, which is the fifth largest country in the world, comprises all the former Portuguese territories of South America. 'The United States of Brazil' consists of twenty states, each of which enjoys a small degree of self-government, but at the same time sends representatives to the central Federal Government. The language is Portuguese, but the great majority of the people are of mixed descent. There are also some pure-blooded Indians and many negroes, the latter being descended from slaves imported in the seventeenth and eighteenth centuries.

As the country is roughly 2,700 miles long and of nearly the same breadth there are great differences between one part and another.

THE AMAZON LOWLAND

This is one of the most thinly peopled regions of the world, the average density of population being less than that of the Sahara. The reasons for this low density of population, in a region where heat and moisture combine to promote luxurious plant growth, are:

1. The dense forests which provide little food, either animal or vegetable.
2. The wet climate which hinders the natives making clearings by burning.

3. The heat and humidity which sap the vitality of the people and favour the spread of disease.

4. The partial extermination of the natives by white rubber-gatherers during the last century.

Up to the end of the nineteenth century the Amazon lowlands were the chief source of the world's rubber, but now

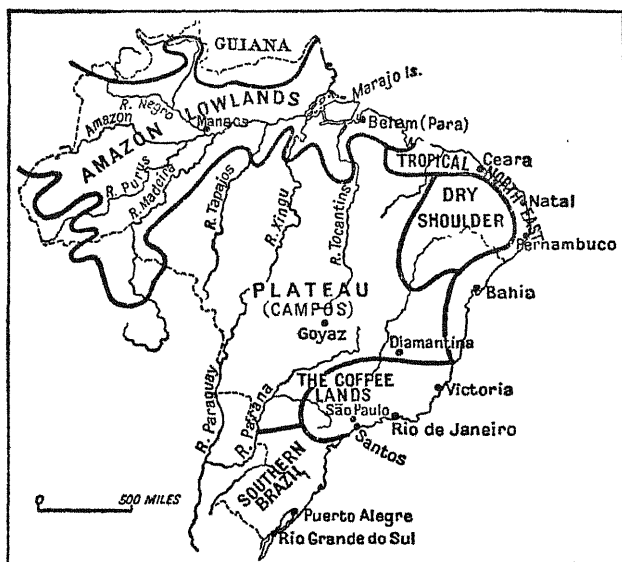


FIG. 102. BRAZIL—NATURAL DIVISIONS

that the plantations of the East Indies yield an abundance of cheap rubber this region produces less than 1 per cent of the world's output. Balata, a substance which, like rubber, is obtained from the latex of a tree, Brazil nuts, hard woods, and a small quantity of cocoa are also exported from the Amazon basin.

Para (Belem), situated on the most navigable distributary of

the river, is the chief port of the Amazon basin. The city has lost most of its trade and importance since the decline of the rubber industry.

Manaos is situated on the river Negro, eight miles above its confluence with the Amazon, and 1,000 miles from the ocean. A regular service of steamers is maintained between *Manaos* and Liverpool, but the total amount of commerce dealt with by the port is now very small.

THE TROPICAL COAST-LANDS

These coast-lands were the first areas to be cultivated by the Portuguese, as they are the nearest to Europe and are suitable for the cultivation of sugar cane. Negro slaves were imported from Africa from the sixteenth century onwards, and as a consequence a large proportion of the people are of negro descent. Sugar cane is still one of the chief products, but there is little export. Cocoa, tobacco, and cotton are also cultivated.

Natal is the nearest South American port to Europe, and is, therefore, an important station on the transatlantic air-route via the Cape Verde Islands. The chief commercial outlets of the region are *Pernambuco* (Recife) and *Bahia*.

THE COFFEE LANDS

Nearly three-quarters of the world's coffee is produced on the plateau immediately behind Rio de Janeiro and Santos. Here the deep volcanic soil and the warm moist climate provide conditions which are ideal for coffee cultivation. The plantations are situated between the heights of 1,800 and 2,500 feet, where there is abundant sunshine without extreme heat.

São Paulo is the chief city of the coffee region, and is also the chief manufacturing centre of Brazil. It is connected to

the port of *Santos* by a remarkable railway which has such steep gradients that each train is hauled up by cables attached to stationary engines.

Rio de Janeiro, the capital of Brazil, is a vast modern city situated on one of the finest harbours in the world.

THE BRAZILIAN PLATEAU

This is a thinly peopled region whose only resources are cattle and minerals. Lack of roads and railways has prevented any great development of either of these resources. The only cattle products exported are hides and a small quantity of sun-dried beef. Gold is produced in the state of Minas Geraes. ('Mines everywhere'), and diamonds at Diamantina. Great deposits of iron and manganese are also known, but there is little mining of these ores.

Goyaz, a small town on the plateau some 600 miles north-west of Rio de Janeiro, has been chosen as the future Federal capital of Brazil.

ARGENTINA

This republic stretches from the Tropic of Capricorn to latitude 55°, a distance of 2,300 miles. This great extension in latitude makes it a country of considerable climatic variety. It is, therefore, necessary to divide it into several natural regions as shown in Fig. 103.

1. **The Pampas.** This is the only highly developed and densely peopled division of Argentina. *Cattle-rearing* has been the chief industry since the beginning of the Spanish occupation, but there was little sale for the beef until the invention of refrigeration in 1883. At the present time Argentina is the world's chief exporter of chilled beef, and

Nelson Line

PANORAMIC VIEW OF RIO DE JANEIRO HARBOUR



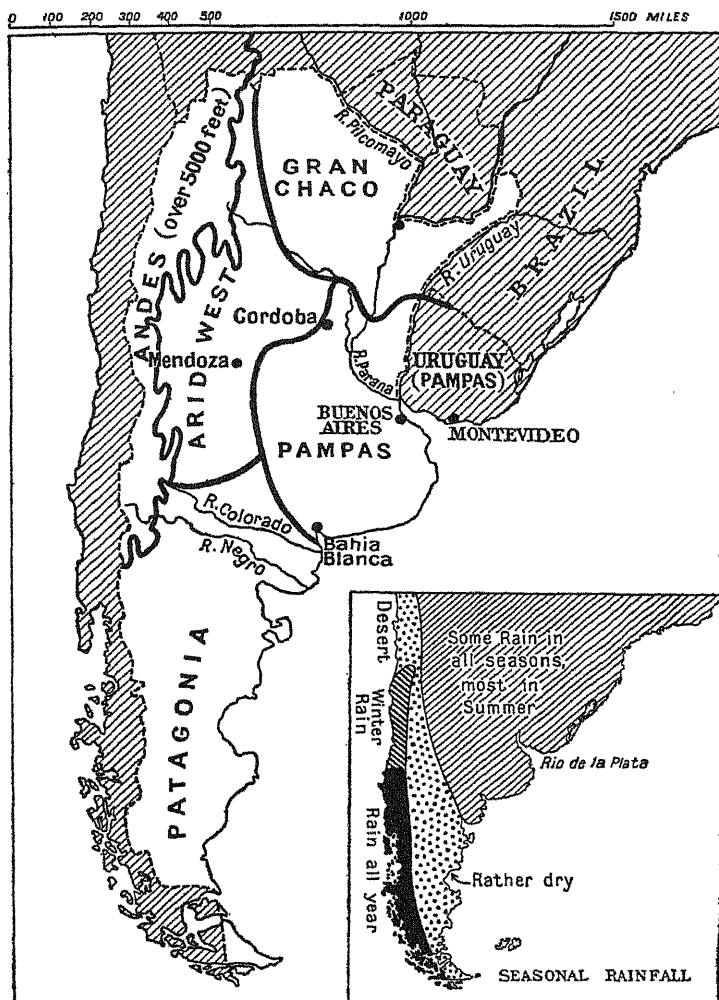


FIG. 103. ARGENTINA—NATURAL REGIONS

supplies Britain with 90 per cent of her imports of that commodity. The ranches are divided by wire fences into paddocks of 50 to 100 acres each. Wind pumps are erected to provide drinking water for the stock and special fodder crops are grown to supplement the natural grasses. Dairying is now of considerable importance in the coastal regions south of the Plata estuary. *Sheep-rearing* is still an important industry on the pampas, though cattle are displacing sheep on the more fertile lands. In spite of a considerable decrease in the total number of sheep, Argentina is still second only to New Zealand as an exporter of frozen mutton and lamb, and is also an important exporter of wool. *Arable farming*.—The pampas, like other temperate grasslands, are eminently suited to the large-scale cultivation of wheat, and Argentina ranks as one of the most important wheat-exporting countries in the world. (For a comparison of wheat-growing on the pampas and the prairies see page 77.) The chief wheat area is a crescent stretching from Rosario in the north to Bahia Blanca in the south. Between this crescent and the coast the land is too wet for wheat; north of it the climate is too hot; and west and south of it the rainfall is insufficient.

Maize and linseed are other important crops of the pampas, and Argentina is the world's leading exporter of both these products. Alfalfa, a deep-rooted plant belonging to the clover family, is widely grown. It not only provides a valuable foodstuff for cattle, but also improves the land on which it is grown.

2. **The Gran Chaco**, or great hunting ground. This is in the main a wilderness of sub-tropical bush, most of which is inhabited only by scattered tribes of Indians. Small areas have, however, been cleared for settlements, and some cattle-ranches and cotton plantations have been established. The chief products of the region are, however, quebracho, a very

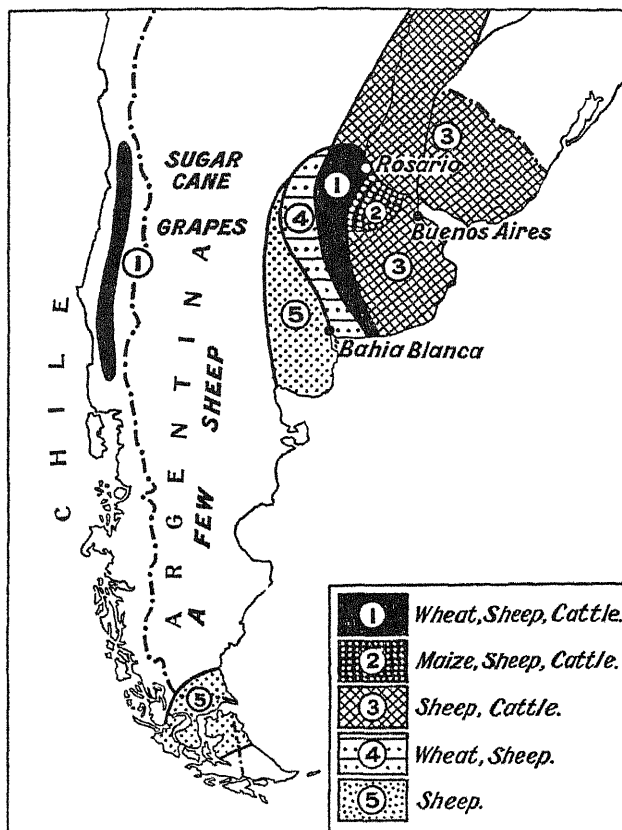


FIG. 104. ARGENTINA—ECONOMIC

hard wood from which tannin is extracted, and yerba-maté, the South American 'tea.' The former is produced chiefly on the western side of the middle Paraguay valley, and the latter in the upper Parana valley.

3. **The Arid West.** This region has only slight rainfall, since

it is situated too far inland to benefit by winds from the Atlantic and no rain-bearing winds reach it from the Pacific. There are, however, several areas which are irrigated by streams which flow from the snow-clad Andes. Chief of such irrigated oases are *Tucuman*, which specializes in the production of sugar cane, and *Mendoza*, which produces most of the grapes and wine of Argentina.

4. *Patagonia*. This region lies in the belt of westerly winds, but it is a region of low rainfall, as these winds have been robbed of their moisture by passing over the Andes. The major part of the province is a rather barren steppe, which provides scanty pasture for flocks of sheep. In the extreme south, however, the land is more fertile, and the cool climate favours the production of good wool. This part of the province is one of the world's chief sheep-rearing districts.

Buenos Aires is the capital of Argentina, the largest city of the southern hemisphere, and the sixth largest city of the world. It grew up around a small creek which in early times provided a sheltered anchorage for ships. The city now spreads for many miles over the almost dead level plain, and numerous modern docks provide accommodation for large ocean liners. It is the centre of the railway system of the country, and conducts the major portion of the foreign trade of the country.

Rosario, at the head of ocean navigation of the Paraguay, and *Babia Blanca*, at the southern end of the wheat crescent, are the chief wheat ports.

URUGUAY AND PARAGUAY

Almost the only point of similarity between these two small republics is their names. Uruguay consists almost entirely of fertile pampa; its people are of European stock, and nearly

the whole of the country is given up to the rearing of cattle and sheep. Paraguay, on the other hand, consists mainly of tropical jungle, and is inhabited by half-breeds who are in the main satisfied to produce only the foodstuffs they require and to gather wild products.

Uruguay exports large quantities of beef, mutton, and lamb; her foreign trade averages £12 per head, and *Montevideo*, the capital and chief port, is one of the largest and finest cities of the southern hemisphere. The foreign trade of Paraguay, however, averages little over £1 per head, the chief exports being yerba-maté and tannin. Its capital, *Asuncion*, was founded 400 years ago by the Spanish as a station on the route by which the silver from the Andes was transported to the La Plata estuary.

CHILE

Physically this republic resembles a long narrow trough which dips into the sea on the west and south. The high eastern side of the trough is represented by the main ranges of the Andes, which rise to a height of 22,868 feet in the peak of Aconcagua. The low western edge of the trough is the Coast Range, whose height seldom exceeds 3,000 feet. The hollow part of the trough represents the Central Valley, which is the most important part of the republic. In the south of Chile the 'trough' is partially submerged, and the Coast Range is represented by a chain of islands and the Central Valley by a series of straits and gulfs.

As Chile stretches for 2,600 miles from north to south it is a country of great climatic contrasts, and may, in fact, be divided into three strikingly different zones.

1. **Northern Chile**, between latitudes 30° S. and 18½° S., is an absolute desert, since the winds blow off-shore all the year

round and so bring hardly any rain. Over large areas there is often no rain at all for several years in succession, and when the long drought is broken it is only by a few passing thunder showers. Although nothing will grow in this region, it is of great value to Chile, as it has great deposits of minerals. Copper is the most valuable of these minerals, and Chile now is second only to the United States in the production of this metal. Chile saltpetre, or sodium nitrate, used as a fertilizer and as the basis of explosives, is also mined in northern Chile. At one time Chile was the world's only source of nitrate, but now the bulk of the world's supply is manufactured in Great Britain, Germany, and other countries, and Chile supplies only one-tenth of the world's needs. The towns of northern Chile are all engaged in the shipping of copper and nitrate. The most important are Iquique and Antofagasta.

2. Middle Chile has a Mediterranean type of climate with rain in winter when the westerlies blow from the sea, and drought in the summer half-year when the winds blow offshore. This region contains practically all the cultivated land in Chile. The two obstacles in the way of intensive farming are the lack of summer rain and the fact that most of the land is in very large estates whose owners take little interest in their domains. In modern times, however, many canals have been constructed to carry water from the Andes to the central valley, and the Government is encouraging the establishment of peasant farms.

Wheat occupies about half the total area of ploughed land, and considerable quantities of grapes and other fruit are cultivated. Cattle and sheep are numerous throughout the region, but the only animal product of commercial importance is wool. Some coal is mined near the port of Concepcion, and copper is produced to the south of Santiago.

Santiago, the capital of Chile, is situated in the Central

CHILE

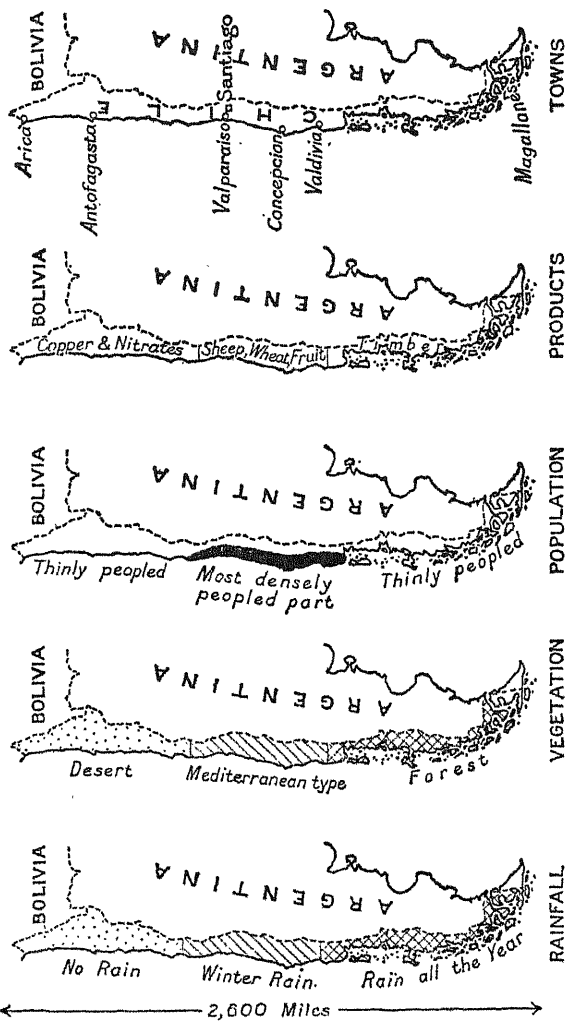


FIG. 105. CHILE

Valley, about 100 miles from *Valparaiso*, which is the chief port of Chile, and, indeed, of the whole of the west coast of South America.

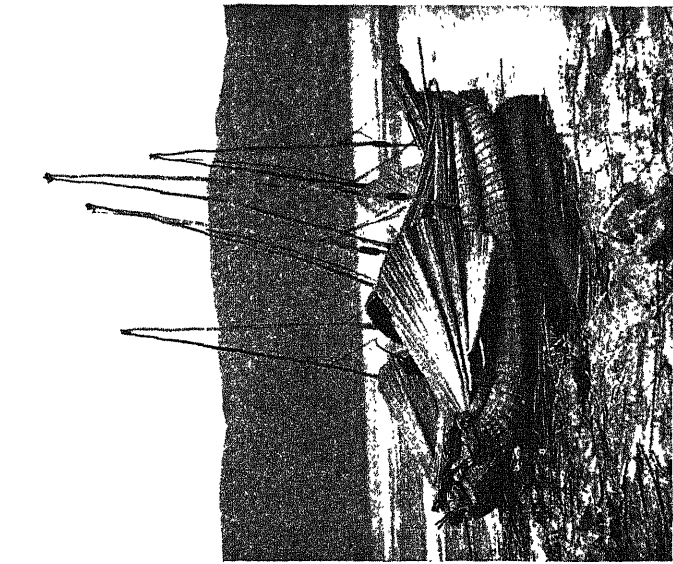
3. **Southern Chile** receives the westerly winds (Roaring Forties, or Brave West Winds) all the year round, and has a moist, equable climate, similar to that of the mountainous parts of north-western Europe. It is, however, a thinly peopled land of forest and swamp, although efforts are being made to develop the lumbering and dairying industries. The only important area of settlements is around *Magallanes* (formerly Punta Arenas) in the extreme south, where large areas of rather dry land are occupied by vast sheep farms. Most of these are run by British companies and large quantities of wool and frozen mutton are exported.

BOLIVIA

This is the only Andean republic without a coast. About two-fifths of its surface is high, cold, barren plateau, and the remainder is hot tropical lowland sloping to the Paraguay River. In spite of the severity of the climate, which almost prevents the growth of crops, nearly all the inhabitants live on the inhospitable plateau. The reason for this is twofold: the lowlands are fever-ridden and subject to floods in summer and drought in winter, and the plateau is rich in minerals.

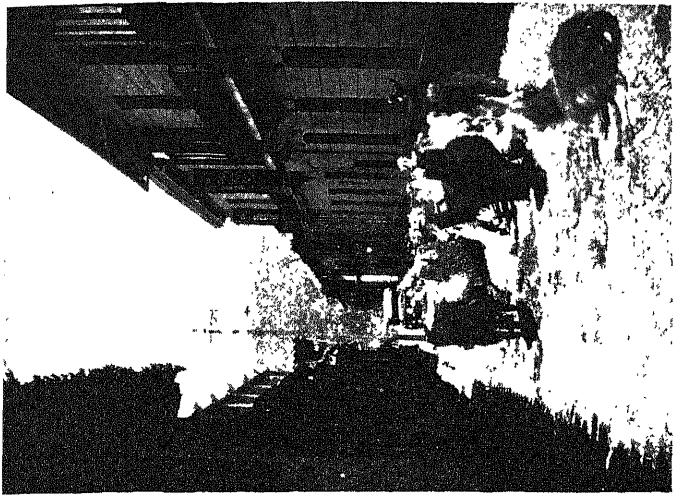
During the sixteenth and seventeenth centuries Bolivia was the world's chief source of silver, and it is estimated that the mines of Potosi have yielded over £400,000,000 worth of that metal. The supply is, however, practically exhausted. Tin is now the chief source of wealth, and, in spite of the high cost of transporting the ore to the coast, Bolivia supplies about 20 per cent of the world's tin.

Potosi and *La Paz* are the important mining centres.



Mondiale

REED BOATS ON LAKE TITICACA



Mondiale

A STREET IN LA PAZ

Note the shadows, indicating vertical sun

Sucre is the nominal capital of the country, but has such an inhospitable climate that the seat of government has been moved to La Paz, which is somewhat sheltered from the icy winds.

PERU

This republic comprises three very different natural regions, viz:

1. A narrow coastal plain which is an almost rainless desert.
2. A broad belt of mountains and plateaus.
3. The eastern lowland drained by the head waters of the Amazon.

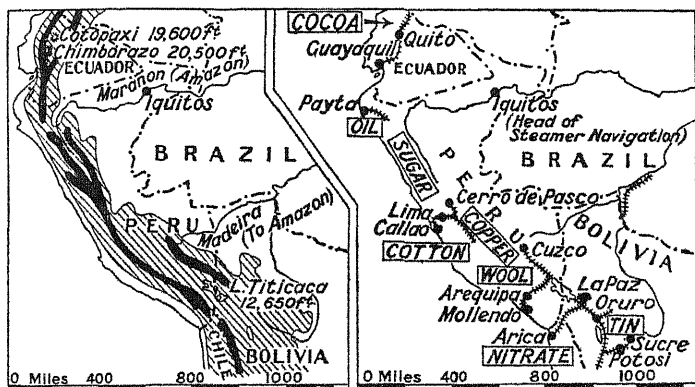


FIG. 106. PERU AND ECUADOR—PHYSICAL AND ECONOMIC

The coastal plain differs from the desert of northern Chile, of which it is a continuation, in that it is crossed by many rivers which provide water for irrigation. The valleys of these streams are therefore intensively cultivated and fairly densely peopled, although between them lie large areas of

uncultivable desert. The chief crops of the irrigated valleys are cotton and sugar cane. Most of the land is in large estates on which the Indians and half-breeds work for very low wages. They are, however, allowed to produce their own food crops on portions of the estate and so are assured of the means of subsistence.

The Peruvian Desert is not rich in nitrate, but some petroleum is obtained near the northern extremity. Guano, which is a valuable fertilizer, is obtained from certain small desert islands near the coast.

The interior plateau was the centre of the Inca Empire, which was destroyed by Pizarro, the Spanish conqueror of the country, in the sixteenth century. *Cuzco*, the ancient Inca capital, is connected by rail to the port of *Mollendo*.

ECUADOR

Ecuador, so-called because it is astride the Equator, is the smallest of the South American republics. Like Peru, it consists of a coastal plain, a cordilleran area, and eastern lowlands. The coastal plain, unlike that of Peru, is hot and wet, but is nevertheless scantily peopled. Some cocoa is produced, and ivory nuts are gathered from the forest trees. *Guayaquil*, the chief port of the country, is situated on a deep inlet at the mouth of the Guayas River. From it a railway climbs to a plateau on which is situated *Quito*, the capital of the republic. Around Quito is an intermontane basin which provides sustenance for some millions of native Indians. The only economic product of the region is panama hats, which are woven by the natives in their own homes.

The eastern plains sloping to the Amazon are hot, wet, and unhealthy, and peopled only by wandering tribes of Indians.

COLOMBIA

This republic differs from the other Andean republics in three important respects:

1. It has two coasts, an Atlantic coast and a Pacific coast.
2. The mountain ranges splay out towards the north, enclosing between them deep valleys which open out northward to a broad coastal plain.
3. The country receives very heavy rainfall. The western coastal region receives rain at all seasons, but the rest of the country has only summer rain, when the vertical sun is north of the Equator. It is therefore of the Sudan type. But the following vertical zones are generally recognized: The Tierra Caliente (below 1,000 metres), the Tierra Templada (1,000–2,000 metres), and the Tierra Fria (2,000–3,000 metres).

The chief cultivated products of Colombia are cocoa, which is grown on the moist lowland, and coffee, which is produced on the mountain slopes around *Medellin* and on the plateau around *Bogota*, the capital. Cattle are reared on the plains in the valley of the Magdalena River and on the interior plains sloping to the Orinoco. The animals are, however, of poor quality, and there is little preparation of meat for export.

Minerals. Petroleum is found in the lower valley of the Magdalena River and is sent by pipe-line to *Puerto Colombia* at the mouth of the river. Platinum is dredged from the rivers on the Pacific side of the Andes. Emeralds are found near *Bogota*.

The chief highway of commerce is the Magdalena River, which is navigable for more than 900 out of its 1,000 miles. Unfortunately, navigation is interrupted by rapids, and the total time taken by cargo vessels from *Puerto Colombia* at the mouth to *Bogota* on the plateau is fourteen days. Railways have been built to circumvent the rapids on the Colombia

River, and in recent years a line has been built across the mountains from Bogota to the port of *Buenaventura* on the Pacific coast.

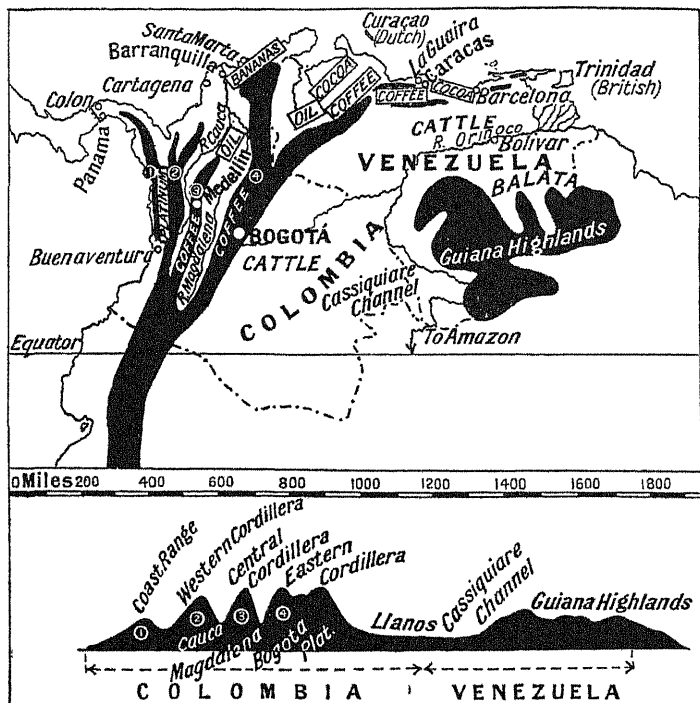


FIG. 107. COLOMBIA AND VENEZUELA, AND A SECTION ACROSS THE TWO COUNTRIES

VENEZUELA.

The coastal plain of Venezuela is wide in the west around the Gulf of Maracaibo but narrows eastwards. The chief products are cocoa, which is grown on the lowlands, and coffee,

which is grown on the hill-sides. The region around Lake Maracaibo is now one of the most important oil-fields in the world. The oil is sent to the Dutch island of Curaçao for refining and export. Farther east on the coastal plain are the ports of *La Guaira* and *Barcelona*.

Behind the coastal plain rise the low ranges which are continuations of the Andes. On the northern range is situated the capital, *Caracas*, at a height of over 3,000 feet. The chief product of this mountain zone is coffee.

The llanos, or grassy plains, of the Orinoco basin are a thinly peopled pastoral region. Cattle-rearing is the chief occupation, but floods in summer, drought in winter, the prevalence of insect pests, and the great distances from the markets hinder the development of the industry. The only important product of the cattle industry is hides.

In the interior are situated the Guiana highlands, which consist of thinly peopled and almost unexplored forest-clad plateaus.

THE GUIANAS

BRITISH GUIANA, which is the only British territory on the mainland of South America, comprises the long slope from the crest of the Guiana Highlands to the Atlantic coast. The coastal plain, which is the only really productive area, has an almost equatorial type of climate, with abundant rain and high temperatures. The chief product of this region is sugar cane, from which is made the brown Demerara sugar. Another important product is rice, which is the chief food of the workers, who were imported from the East Indies. In the interior bauxite, the ore from which aluminium is obtained, and gold are mined. From the forest green-heart, a specially hard timber, and balata, a substance similar to rubber, are

produced. The capital of British Guiana is *Georgetown*, situated at the mouth of the Demerara River.

DUTCH GUIANA and FRENCH GUIANA are backward regions whose combined population equals only half that of British Guiana. *Paramaribo* is the capital of Dutch Guiana, and *Cayenne* the capital of French Guiana. The chief products are sugar, rice, and cocoa.

CHAPTER XI

AFRICA

WITH the exception of Euro-Asia, Africa is the largest continental land mass. It is symmetrically placed across the Equator, the north and south coasts being about 35° N. and 35° S. respectively, though the southward tapering of the continent makes the part north of the Equator about twice the size of the part south of the Equator.

Physically the continent is a great plateau of hard old rocks, with a narrow coastal plain, and only one area of 'young' fold mountains—the Atlas ranges of the north-west. On the plateau there are numerous basins with no outlet to the sea. These 'inland drainage areas,' as they are called even though, in many cases, there are no perennial streams within the basins, have an area equal to roughly a third of that of the whole continent. The rivers of Africa have their value as commercial highways reduced either by lack of water or by the presence of waterfalls. The Nile, for example, pours no water into the Mediterranean for part of the year; the Orange River almost dries up before reaching the Atlantic coast; and the Niger, the Congo, and the Zambesi have waterfalls at the points where they plunge from the plateau to the coastal plain.

Climatically Africa is characterized by high temperatures at all seasons, even the extreme northern and southern portions having winters at least as warm as our summers. The northward and southward swing of the Heat Equator, the belts of winds, and the belt of convection rainfall has already been noted (see p. 34), and the division into natural regions should be revised from Chapter III and the map at the end of the book.

THE PEOPLES OF AFRICA

The vast majority of the native inhabitants of Africa have some negro blood in their veins, but the pure negroes are found

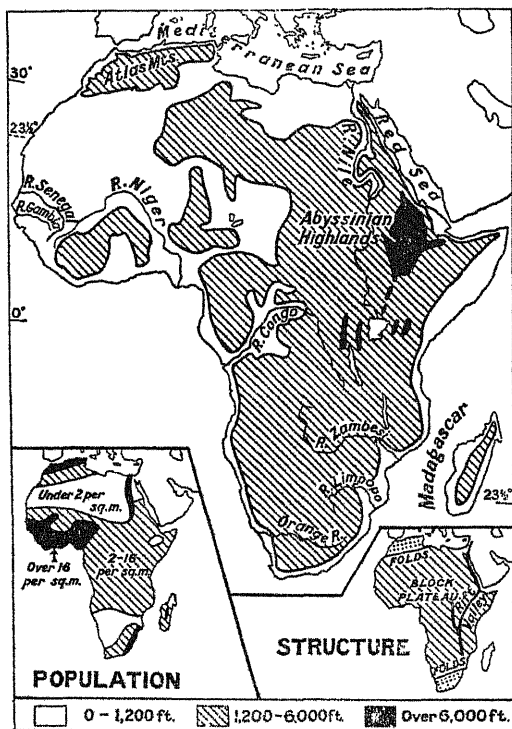


FIG. 108. AFRICA—PHYSICAL

chiefly between the Equator and the southern edge of the Sahara. The Hamites (i.e. sons of Ham, see Genesis ix. 18) are the dominant race of northern Africa and the Semites (sons of Shem) are also widely distributed over northern

Africa. South of the Equator the dominant people are the Bantus, who, though similar to the negroes in many respects, have an admixture of Hamitic blood. The Pygmies, the Hot-tentots, and Bushmen are primitive peoples who have taken refuge from the stronger Bantus in the Congo forest, the coastal desert of South Africa, and the Kalahari semi-desert respectively.

THE ATLAS LANDS

The Atlas lands of north-west Africa comprise the French possessions of Morocco, Algeria, and Tunisia, together with Spanish Morocco and the small international zone around the port of Tangiers. The region has a Mediterranean type of climate with warm, rather moist winters and hot, dry summers. As shown by the physical map, and the section, Fig. 110, the Atlas region may be divided into four physical divisions, namely:

1. The coastal, or *Tell*, region, which receives moderate rain in winter from the north-westerly winds. This is the only part of the Atlas region where intensive cultivation is carried on, and it is consequently the most densely peopled and most productive part. The chief products are wine, which is exported in considerable quantities to France, and fruits such as olives, grapes, and tomatoes.

2. *The Maritime Atlas*, or *Tell Atlas*, whose somewhat barren slopes support scanty flocks of sheep and goats and produce small quantities of cork.

3. *The Plateau of the Shotts*, so-called because of the existence of salt-lakes or shotts. The plateau is in the rain-shadow of the Maritime Atlas, and so receives insufficient rain for cultivation. It is peopled only by nomadic Arabs who tend flocks of sheep and goats and herds of camels. Esparto grass, which grows wild, is exported for use in the paper trade.

4. *The Saharan Atlas*, which are even more barren than the Maritime Atlas.

Minerals. Iron ore and phosphate are exported from all three French states.

Communication and towns. The main line of railway runs

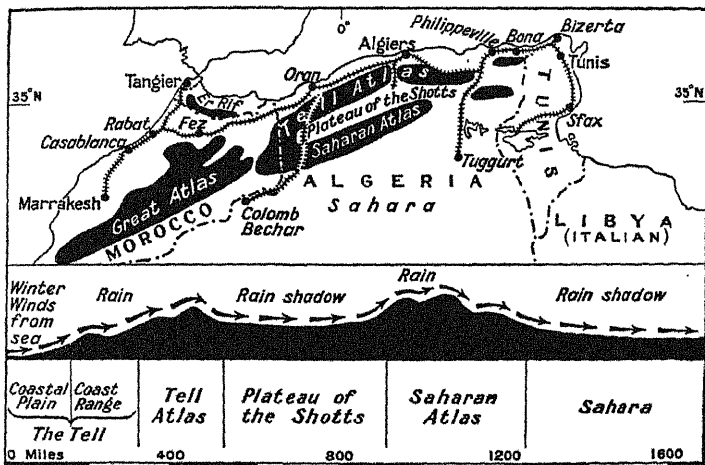


FIG. 110. THE ATLAS LANDS

along the coast from Gabes in Tunisia, through the ports of Bona, Philippeville, and Oran in Algeria, to the modern French port of Casablanca in Morocco. From the ports of Oran and Philippeville railways run southward across the Atlas Mountains to Colomb Bechar and Tafilet, oases in the Sahara from which caravan routes run across the desert to West Africa. These routes in modern times are traversed by special motor vehicles and by aeroplanes.

THE SAHARA

The Sahara forms the major portion of the old-world desert belt which stretches diagonally from the Atlantic coast of Africa to the Gobi in north-eastern China. The Sahara comprises three types of land surface, viz.:

(a) Plains or plateaus of hard sand and pebbles, (b) stretches of rock-strewn plateau above which rise mountain ranges, and (c) the sandy desert, comprising the sand-dunes, such as are usually seen in pictures of the desert. This sandy portion, however, occupies only about one-tenth of the total area of the Sahara. The desert is not entirely devoid of vegetation, and in all but the very driest parts small bushes and clumps of wiry grass provide sustenance for the goats, sheep, and camels of the nomadic Bedouin Arabs. Dotted about the Sahara are numerous oases, most of which derive their water from wells sunk down to the water table. Many of these oases are very large. The Tafilet oasis of Morocco, for example, has an area of 5,000 square miles and a population of 150,000, while the Figig oasis contains several towns and nearly a million palm trees. The chief product of the oases is dates which are exported in considerable quantities from Tunisia. Other crops produced in the oases, chiefly for home-consumption, are maize, wheat, barley, oats, vegetables, and fruits.

The major portion of the Sahara is under French rule. On the Atlantic coast is the Spanish territory of Rio de Oro, which, in spite of its name, 'River of Gold,' is almost absolute desert. In the east the desert is divided between Egypt and the Anglo-Egyptian Sudan, and the northern portion, between Egypt and the Barbary States, is the Italian possession of Libya. In recent years the Italians have made great efforts to develop this possession in spite of its aridity.



Mondiale

THE OASIS OF SIWA

WEST AFRICA

As will be seen from the Fig. III West Africa consists of two chief climatic and vegetation divisions, namely:

1. The southern region of equatorial forests which has heavy rain and high temperatures at all seasons.
2. The interior region of tropical grasslands, or savannahs, where rain falls only in the summer half of the year.

Politically, West Africa is divided between France and Britain. The chief British territories are:

1. THE GAMBIA, a narrow strip of territory situated on each side of the river Gambia. The only important product of this colony is ground-nuts, which are exported from the capital, *Bathurst*.

2. SIERRA LEONE, which is situated almost entirely in the forest region. The chief products are palm oil and palm kernels. Iron ore is also exported. The capital is *Freetown*, situated at the mouth of the Rokelle River.

3. THE GOLD COAST, with which is included the Protectorate of Ashanti. The chief product of the Gold Coast is cocoa, which is cultivated by the natives on the hot, wet, coastal plain. Though cocoa was introduced only fifty years ago, conditions on the Gold Coast have proved so suitable that the country now produces more than half the world's supply. Gold and diamonds are also produced on the Gold Coast. *Takoradi* is a modern port at which a great breakwater has been built to enable ocean vessels to load cargo without the use of surf boats. *Accra* is the capital.

4. NIGERIA. In the southern or forest region of Nigeria the chief products are palm oil and palm kernels. Some cocoa is also produced. In the grassland region of Central Nigeria the chief products of economic importance are ground-nuts

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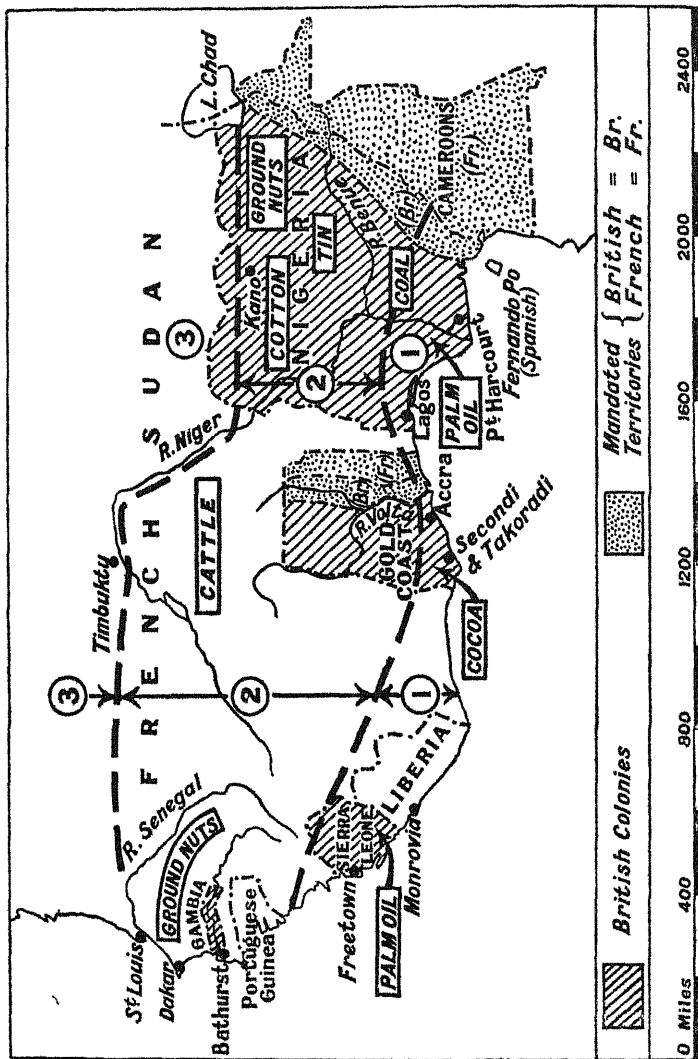


FIG. III. WEST AFRICA

and cotton. In Northern Nigeria, where the rainfall is small and falls during only two months of the year, the natives depend chiefly on their cattle. Hides are exported from this region.

Minerals. There is an important coal-field at Udi, and the Bauchi plateau produces tin.

Routes and towns. Lagos, the capital of Nigeria, is situated on a lagoon which is connected by natural waterways with the mouth of the Niger. From Lagos the main line of railway runs northward through Bauchi and Udi to the ancient city of Kano. Port Harcourt, on the eastern side of the delta of the Niger, is also connected to the interior by railway.

THE FRENCH TERRITORIES are less highly developed than the British colonies, but their products—ground-nuts, palm oil, and cocoa—are similar. Timbuktu, on the great bend of the Niger, is an ancient terminus of caravan routes, but as a trading centre it has been supplanted by a modern town some miles downstream.

THE CONGO BASIN

THE BELGIAN CONGO comprises nearly the whole of the basin of the river Congo. The lowlands are densely forested and produce rubber, palm oil, and copra, while the high land in the south produces coffee and ground-nuts. The Katanga district in the south of the Belgian Congo is one of the richest mining districts in the world. Copper is the chief mineral, and most of the world's supply of radium comes from the same district. Diamonds, obtained from alluvial deposits in the south-west, are second to copper in the value of the output.

BRITISH SOUTH AFRICA

British South Africa comprises (a) The Union of South Africa, which was formed by the union of two British colonies, Cape of Good Hope and Natal, with the former Boer states of the Orange Free State and the Transvaal.

(b) South-west Africa, which was formerly a German colony,

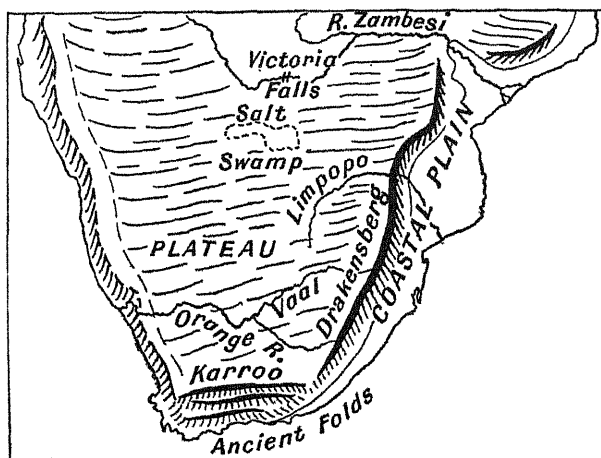


FIG. 112. SOUTH AFRICA—PHYSICAL

but which was mandated to the Union of South Africa by the peace treaties of 1919.

(c) Three protectorates of native territory, viz., Basutoland, Swaziland, and British Bechuanaland.

(d) The protectorates of Southern and Northern Rhodesia.

Physically, South Africa consists of a plateau which rises steeply from the coast. The high eastern edge of the plateau forms a range of mountains called the Drakensberg. From the

crest of the Drakensberg the Orange River flows westward, gradually losing volume as it approaches the sea. Its tributary, the Vaal, separates the Orange Free State and the Transvaal. From the slopes of the Drakensberg, small rivers such as the Tugela flow to the Indian Ocean. Two great rivers which flow to the east coast farther north are the

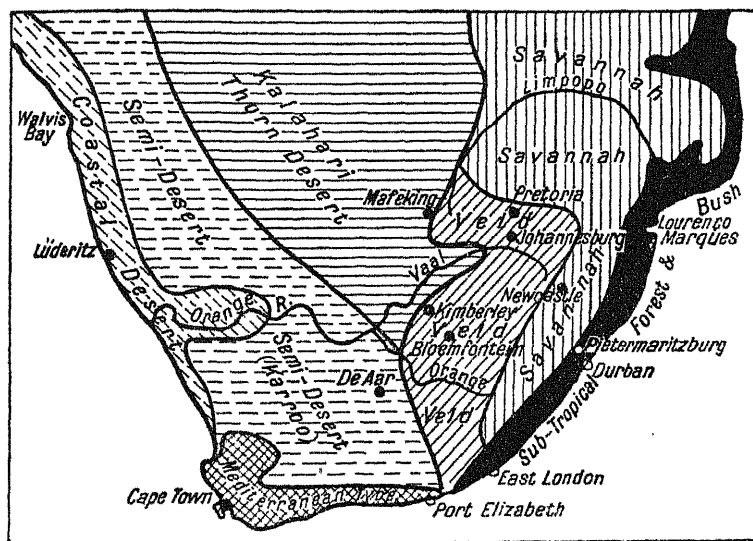


FIG. 113. SOUTH AFRICA—VEGETATION

Limpopo, which forms the northern boundary of the Transvaal, and the Zambesi, which is notable for the mighty Victoria Falls, two and a half times as high as Niagara.

Climate. The climatic divisions of South Africa are:

1. *The Mediterranean region* of the south-west, which receives rain in winter from the prevailing north-westerly winds, but has a hot, dry summer.

2. *The warm, moist, coastal plain of Natal*, which receives abundant rain from the prevalent south-east trades.

3. *The veld*, which is situated in the rain-shadow of the Drakensberg. The eastern portion of the veld receives about thirty inches of rain, most of which falls in summer. Westward, however, the rainfall gradually diminishes until on the west coast it averages only five inches per year. Corresponding with this diminution in rainfall from east to

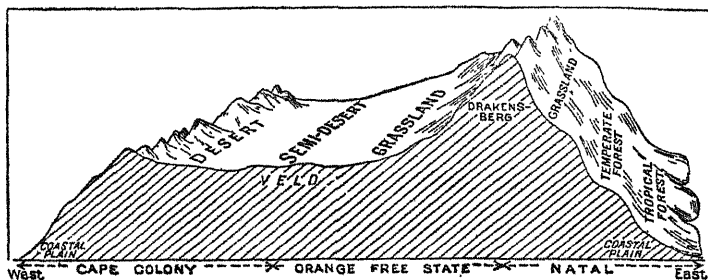


FIG. II4. SOUTH AFRICA—BLOCK DIAGRAM

west is a diminution in the luxuriance of the vegetation from good grassland in the east to poor grassland and semi-desert in the west.

4. *The Kalahari* which is a semi-desert, suitable only for extensive grazing by cattle and sheep. The coastal strip, which is known as the Namib, receives less than five inches of rainfall, is an absolute desert, unrelieved by any oases.

OCCUPATIONS OF THE PEOPLE

Mining. South Africa is the chief gold-mining country in the world, producing about 40 per cent of the world's output. The great mining region is the Rand, round the city of Johannesburg in the Transvaal. The gold is obtained from very

deep mines, some of which have been sunk to a depth of over 8,000 feet through the solid rock or reef which forms the Rand district. All the unskilled labour is provided by natives who bind themselves to work for the company for six months at a time. They live in huts grouped in a rectangular compound,

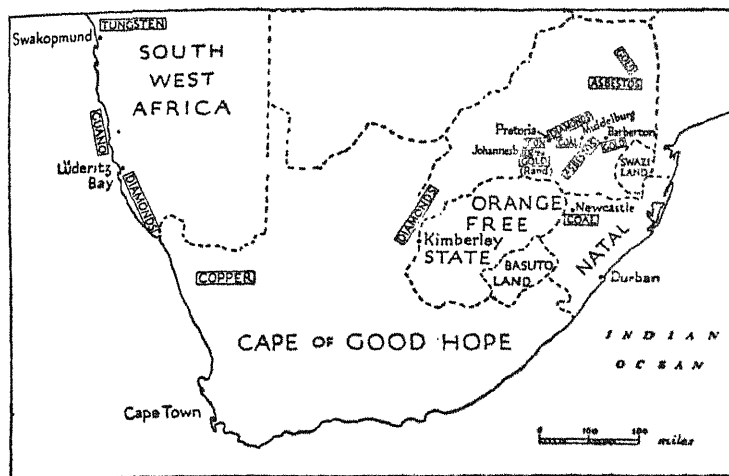


FIG. 115. SOUTH AFRICA—MINERALS

and are unable to leave the vicinity of the mine without special permission.

Diamonds are produced near Kimberley in Cape Province, at Pretoria in the Transvaal, and near the mouth of the Orange River in South-west Africa.

Coal is third mineral in order of the value of production. The chief mining centres are Newcastle and Dundee in Natal, and Middelburg in the Transvaal.

Agriculture. Wheat is grown chiefly in the Mediterranean region around Capetown, but maize is the chief cereal in the rest of South Africa. Throughout the moister parts of the

Union the latter cereal is the chief foodstuff for animals and humans. The chief maize-growing area is the so-called 'Maize Triangle' between Kimberley, Pretoria, and Bloemfontein.

Grapes are grown chiefly in the Mediterranean region around Capetown, both table grapes and wines being exported. Oranges are produced chiefly in the coastal region of Cape

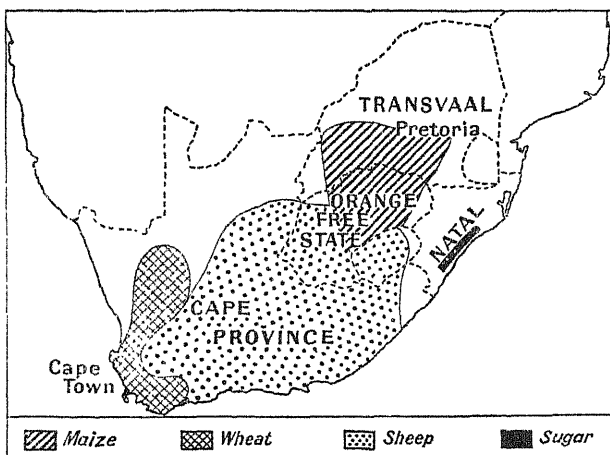


FIG. 116. SOUTH AFRICA—FARMING

Province and Natal. The fruit is picked in the southern autumn, and so arrives in England during the summer when supplies from Spain and other orange-growing districts of the northern hemisphere are not available. Deciduous fruits, such as peaches, apricots, and plums, are grown chiefly around Capetown. Sugar cane is grown on the hot, moist coastal plain of Natal.

Pastoral farming. The farmers of the veld depend chiefly on cattle for their livelihood. The land is, however, rather

arid, and it is necessary to have at least four acres, and sometimes fifty acres, for one cow. The best ranching areas are in the northern and eastern Transvaal, but even here the cattle are usually sold to maize farmers, who fatten them up ready for the market. Oxen are the chief draught animals of South Africa, and a small export trade in frozen beef has developed. Dairying is carried on near the large towns, but there is no surplus of butter, cheese, or milk for export. Angora goats, which yield the valuable silky wool or hair known as mohair, are reared on the karoos. In the dry region of South-west Africa a special type of sheep known as karakuls produce the curly wool called astrakhan. Ostriches were formerly reared in large numbers on the dry grasslands, but, as the demand for ostrich feathers has almost ceased, the industry has dwindled to insignificance.

CITIES

Capetown, the capital of Cape Colony, is situated on Table Bay at the foot of Table Mountain. It is the terminus of the Cape to Cairo route which runs northward to the Congo, and may in future be continued to link up with the railways of East Africa and the Anglo-Egyptian Sudan. It exports gold, diamonds, and fruit. Other ports of the Cape of Good Hope are *Port Elizabeth* and *East London*, the latter being the chief wool port of the Union. *Durban*, in Natal, is the chief port of the Union, though it is a smaller city than Capetown. In modern times it has become an important industrial centre. *Pietermaritzburg*, the capital of Natal, is situated on a slope of the Drakensberg. *Newcastle*, situated on the main railway running from Durban, through Pietermaritzburg, to the Transvaal, is a coal-mining centre and has large iron and steel works. *Bloemfontein* is the capital of the Orange Free State

and the judicial capital of the Union. *Johannesburg*, the 'Golden City,' is the centre of the gold-mining district of the Rand, and next to Cairo is the largest city of Africa.

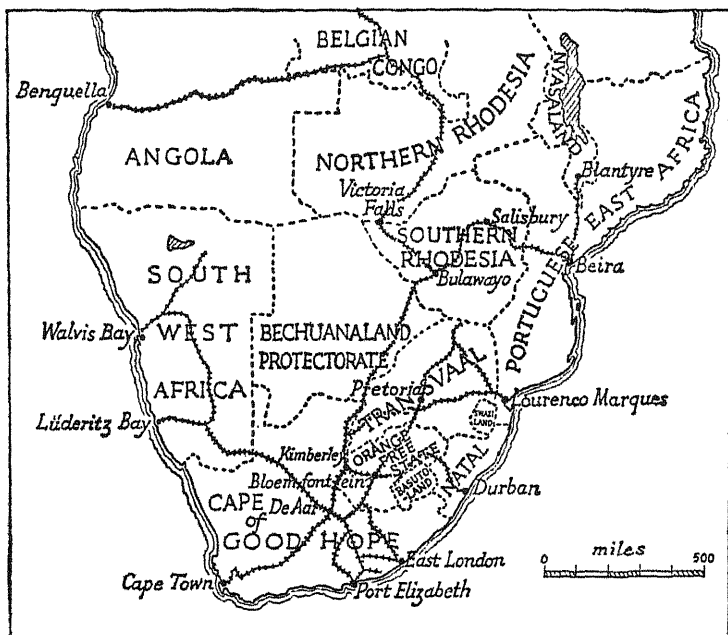


FIG. II7. SOUTHERN AFRICA—RAILWAYS

Pretoria is the capital of the Transvaal and the administrative capital of the Union.

BRITISH TERRITORIES OUTSIDE THE UNION

South-west Africa. This territory was formerly a German colony and is now governed by the Union of South Africa as a mandated territory. It is an arid region consisting chiefly of desert and semi-desert, and the population averages

much less than one per square mile. Most of the people are engaged in pastoral farming, there being some half-million cattle, 250,000 sheep, and 300,000 karakuls. Diamonds, copper, lead, and silver are mined. *Swakopmund*, the capital of the territory, is situated on Walvis Bay which, with the small area around it, was a British possession even before the War. *Lüderitz*, a small port from which a railway runs into the interior, is the centre of the diamond-mining area.

Swaziland and *Basutoland* are native territories in which whites are not allowed to settle without special permission. Basutoland is the most thickly populated territory in South Africa, all the arable land being under cultivation.

Bechuanaland Protectorate lies between Cape Colony, South-west Africa, the Transvaal, and Southern Rhodesia. The population numbers 160,000 natives and about 2,000 whites.

Southern Rhodesia. The surface of this Protectorate consists of high, undulating, grass-covered plains. Of the million inhabitants only 45,000 are whites. The natives grow food crops such as maize and millet and keep herds of cattle of poor quality. The white settlers are engaged chiefly in the production of maize and tobacco, in ranching, and in superintending mining. The chief minerals are asbestos, chrome-iron ore, and coal. This last is worked at *Wankie*, 50 miles south of the Victoria Falls. *Salisbury* is the capital, but *Bulawayo* is the largest town and the only important centre of population.

Northern Rhodesia. Here as in Southern Rhodesia the chief interests of the white people are the production of beef, maize, and tobacco. Mining is carried on at *Broken Hill*, where copper and zinc are produced. *Livingstone* was, until recently, the capital of the Protectorate.

NON-BRITISH TERRITORIES IN SOUTH AFRICA

1. *Angola, or Portuguese West Africa.* This is a savannah land with rain in the summer half of the year. It is capable of considerable development, as there are large areas suitable for ranching and white settlement. Maize, tobacco, and coffee can be successfully cultivated, but the white population at present numbers only 30,000. *Loanda*, the capital, is an ancient seaport. *Lobito*, on a good natural harbour, is the terminus of the Benguela railway which runs eastward to the Katanga mining district of the Belgian Congo, and has therefore become, in recent years, the chief port.

2. *Mozambique, or Portuguese East Africa.* This territory, though farther from the Equator, has a warmer climate than Angola, since it is washed by the warm Mozambique current, while the coast of Angola is washed by the cold Benguela current. White-owned plantations are numerous, the chief products being sugar, sisal-hemp, and coco-nuts. Many of the natives migrate temporarily to the gold and diamond mines of British South Africa. *Lourenço Marques* and *Beira* are the chief ports, the former being connected by rail to the Transvaal, and the latter by rail to Southern Rhodesia.

ISLANDS OF THE INDIAN OCEAN

Madagascar is one of the largest non-continental islands of the world. It is a great block which was torn, ages ago, from the main mass of Africa, and tilted so that the high eastern edge of the block rises steeply to a height of 5,000 feet, while from this escarpment the land slopes gradually to the west coast. As the island is fully exposed to the south-east trades it has heavy rain all the year round, though the north-western side is in the rain-shadow and there the rainfall is deficient.

The French have introduced the plantation system, and vanilla, coffee, and oil-seeds are exported. *Tamatave* on the east coast is the chief port, and from it a railway runs to *Antananarivo*, the capital, situated on the plateau.

Réunion is a small French island situated 400 miles east of Madagascar. It produces cane sugar and vanilla.

Mauritius is a British island, and is one of the most densely peopled areas in the world. The staple industry is the production of cane sugar, though tobacco and hemp have been introduced in recent years.

The *Seychelles* are another group of British islands which form a coaling station on the route from East Africa to India.

BRITISH EAST AFRICA

British East Africa comprises the territories of Uganda, Kenya, Tanganyika, Nyasaland, and Zanzibar. Tanganyika was formerly a German colony and is administered by Britain under mandate from the League of Nations.

Two main physical divisions may be noted:

1. The coastal plain which is hot, wet, and rather unhealthy, except in the extreme north of Kenya, where it is too dry for cultivation.

2. The plateau region, which is enclosed between two branches of the great African rift valley (see Fig. 118). The western arm of the rift valley contains the lakes Nyasa, Tanganyika, Edward, and Albert. The eastern arm, though not so well marked on the physical map, is much longer, being prolonged through Lake Rudolf and the middle of Abyssinia, to the Red Sea, and thence up the Gulf of Aden to the Dead Sea and the Jordan valley. Much of the plateau between the heights of 6,000 and 7,000 feet is sufficiently cool at all seasons to be suitable for occupation by white people. The chief centres of white occupation are around Nairobi, in Kenya

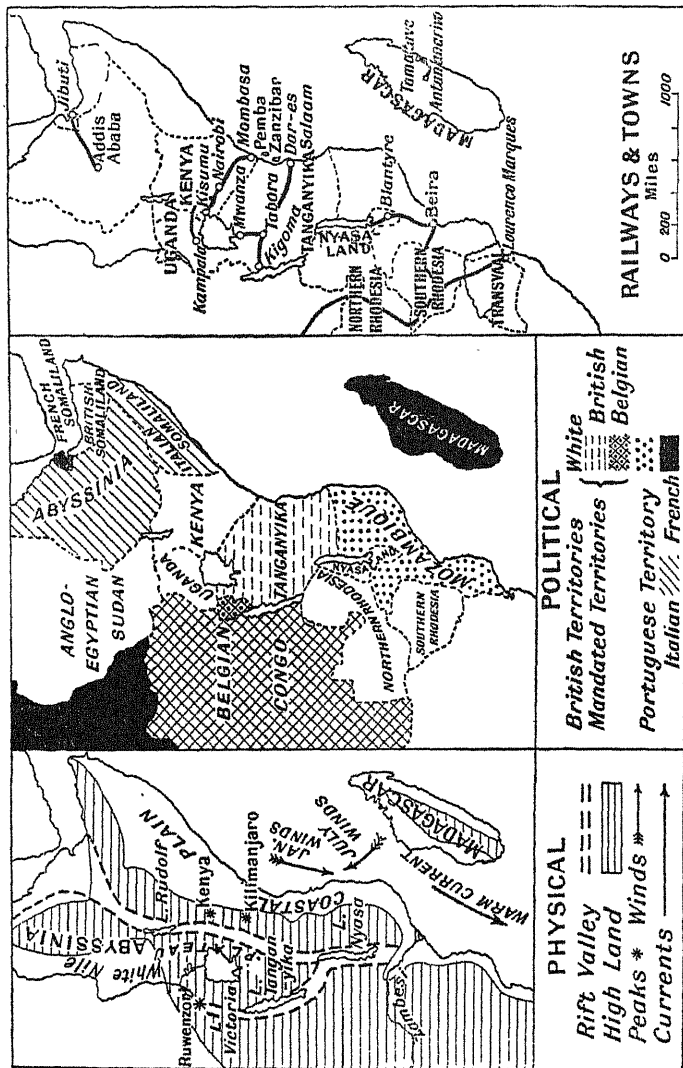


FIG. 118. EAST AFRICA

Colony, and on the highlands of Tanganyika. The white settlers are engaged chiefly in ranching and the production of such crops as coffee, maize, sisal-hemp, and tobacco. The native inhabitants live mostly by tending herds of cattle. Certain tribes, however, live by agriculture, and in Uganda the natives produce fine quality cotton which finds a ready sale on the world's markets. In Tanganyika and Nyasa the natives produce coffee and tobacco.

Drawbacks to cattle-rearing, both by natives and whites, are the prevalence of tsetse flies, whose bite is fatal to cattle, and locusts, swarms of which frequently eat up every green leaf.

Towns and Routes. *Mombasa* is the chief port of Kenya. From it the Uganda Railway runs through *Nairobi*, the capital of Kenya, to Lake Victoria. *Dar-es-Salaam* is the capital and chief port of Tanganyika Territory. From it the main line of railway climbs up to the plateau, and thence to Lakes Victoria and Tanganyika.

Zanzibar and *Pemba* are two islands, some twenty miles from the coast, which together form a British protectorate. The city of Zanzibar was formerly the capital of the Arab dominions in East Africa and the centre of the slave trade. The islands produce nearly the whole of the world's supply of cloves.

THE NILE BASIN

The main stream of the Nile flows from Lake Victoria on the equatorial lake plateau. After entering and leaving Lake Edward the river plunges in a series of cataracts over the edge of the plateau, then flows across the grasslands of the Anglo-Egyptian Sudan. In this portion of its course the fall of the river is so small that floating masses of vegetation, called *sud*, would choke up the channel if it were not kept clear by cutting away the growing masses.

The chief tributaries of the Nile—the Blue Nile and the

Atbara—flow from the Abyssinian Mountains which receive very heavy rain in summer from the monsoon winds which are drawn right across Africa from the Atlantic. The summer floods of these rivers provide the water which floods Egypt during the late summer and the autumn months.

Below its confluence with the Blue Nile at Khartoum the Nile begins to fall more rapidly and passes over a series of six cataracts, or rapids. Here, too, the Sudanese savannah land gives way to desert. In Egypt the broad trough through which the Nile flows is subject to the annual floods of the river and is also irrigated by means of reservoirs which store up the surplus flood water for use in the spring and early summer.

COUNTRIES OF THE NILE BASIN

Anglo-Egyptian Sudan is so-called because it is ruled over jointly by Britain and Egypt. The southern half of the country, which is largely savannah land, is inhabited by native tribes who depend upon their herds of cattle. There is, however, no export of beef, the only cattle product of commercial importance being hides. The most productive part of the Anglo-Egyptian Sudan is the Gezira plain in the angle between the Blue Nile and the White Nile. This plain is irrigated from the Sennar dam, which is situated on the Blue Nile. The irrigated area is devoted almost entirely to the production of high-grade cotton, most of which is exported to Lancashire.

The most important product of the semi-desert lands between the savannah and the desert is gum arabic, which is obtained by tapping certain trees of the acacia family.

Khartoum, the chief city of the Sudan, is situated at the confluence of the White Nile and the Blue Nile. It is linked by railway to Egypt and Port Sudan on the Red Sea, and from it steamers ply up the Nile to the border of Uganda. *Port Sudan*, on the Red Sea, is the chief outlet for the trade of the

Anglo-Egyptian Sudan. It is a modern port which has replaced the ancient port of Suakin.

Egypt. Egypt is rightly said to be the gift of the Nile, since without the Nile there would be no Egypt. From the dawn of history the floods of the Nile have fertilized its flat-bottomed valley and enabled the natives to grow food crops. In modern times, however, the system of perennial irrigation from reservoirs such as that at Aswan has enabled the natives to produce three crops a year from each field. As a consequence the population and foreign trade of Egypt have greatly increased. About two-thirds of each farm is devoted to the production of food-crops, such as maize, sugar cane, millet, and vegetables, and the remaining third is usually devoted to the cultivation of cotton of the highest grade, which is exported to Lancashire. Every year about two million bales of cotton are being exported from Egypt, the money received for the cotton being used to buy agricultural machinery, clothing, and other manufactured goods.

Cairo, the capital of Egypt, is the largest city in Africa. Situated just above the delta, it has the advantage of being at the focus of the natural trade routes. Its suburb, Heliopolis, is an important air-port at the junction of the routes from Europe to India and South Africa. **Alexandria** is the chief port of Egypt, situated some thirty miles west of the delta. It deals with about 90 per cent of the foreign trade of Egypt, its chief exports being cotton, cotton-seed, and eggs. **Port Said** is the northern terminus of the Suez Canal, and is not so much a port for Egypt as a coaling station for vessels using the canal. The canal itself is a vital link between the Mediterranean and the Far East, and though it was built by a Frenchman, de Lesseps, most of the share capital is now owned by the British Government. The southern terminus of the canal is the ancient city of **Suez**, near which is an important petroleum depot.

CHAPTER XII

AUSTRALASIA

AUSTRALIA

PHYSICAL FEATURES

THIS continental island consists of the following physical divisions (see Fig. 120).

1. **The Western Plateau** which occupies almost all the western half of the country. In the south, along the shores of the Great Australian Bight, is the barren Nullarbor Plain, so-called from the absence of trees. In the interior certain ranges rise above the level of the plateau, examples being the Musgrave Range and the Macdonnell Range. The lakes, of which so many are seen on the map, are in most cases merely salt swamps. The rivers, such as the Fitzroy and the Victoria, are frequently merely chains of pools.

2. **The Central Lowland.** This region may be divided into:

(a) *The Carpentaria basin*, which is drained by numerous small rivers of which the Flinders is the chief.

(b) *The Lake Eyre basin*, which is drained by Cooper Creek and the Diamantina river. The area shown on the map as Lake Eyre is usually occupied by a large salt flat which is covered with water only after the occasional thunderstorms.

(c) *The rift valley* of South Australia. Spencer's Gulf formerly extended northward to link up with Lake Eyre, but diminution in the rainfall has cut off the interior basin from the coast.

(d) *The Murray basin.* This area has more rainfall than the

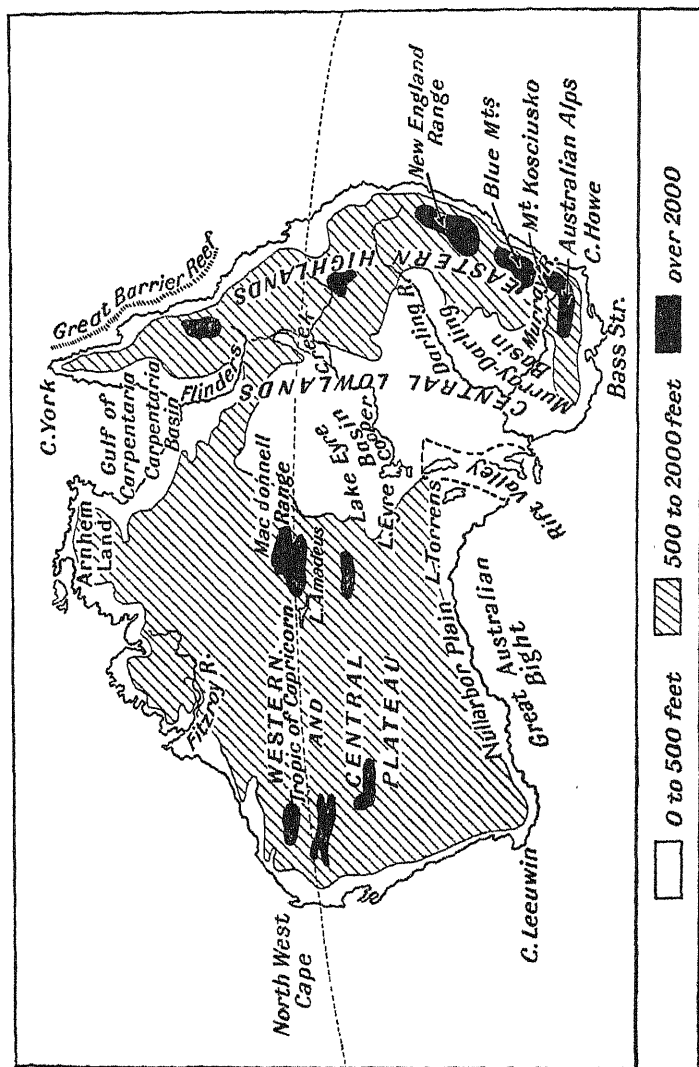


FIG. 120. AUSTRALIA—PHYSICAL

above-mentioned lowlands, but even here there are few perennial streams, even the Darling being for many months at a time only a series of disconnected pools. The Murray, however, of which the Darling is a tributary, contains water all the year round.

3. The Eastern Highlands which extend for more than 2,000 miles from Cape York to the shores of Bass Strait. It comprises numerous individual mountain ranges, of which the most notable are the New England Range, the Liverpool Range, the Blue Mountains, and the Australian Alps. The watershed lies near to the eastern coast and so the rivers are short and rapid.

The Great Barrier Reef is a chain of coral reefs and islands which stretches for a distance of 1,500 miles and has a width of 10 to 20 miles. It forms a sheltered water-way off the coast of Queensland.

CLIMATE

As will be seen from Fig. 121 Australia comprises the following climatic divisions:

1. *The forest region* of the eastern highlands. This area receives abundant rain at all seasons from the prevailing south-east trades, and as the temperatures are always high, the region is forested. In the north the forests are dense and remain uncleared but in southern Queensland, New South Wales, and Victoria large areas of the forest have been cleared for settlement. This cleared sub-tropical and temperate forest region is the most densely peopled area in Australia.

2. *The tropical north*. This region receives some rain in summer from the monsoon winds which are drawn in towards the heated interior. The rainfall is, however, abundant only in the coastal regions. In the interior there is insufficient

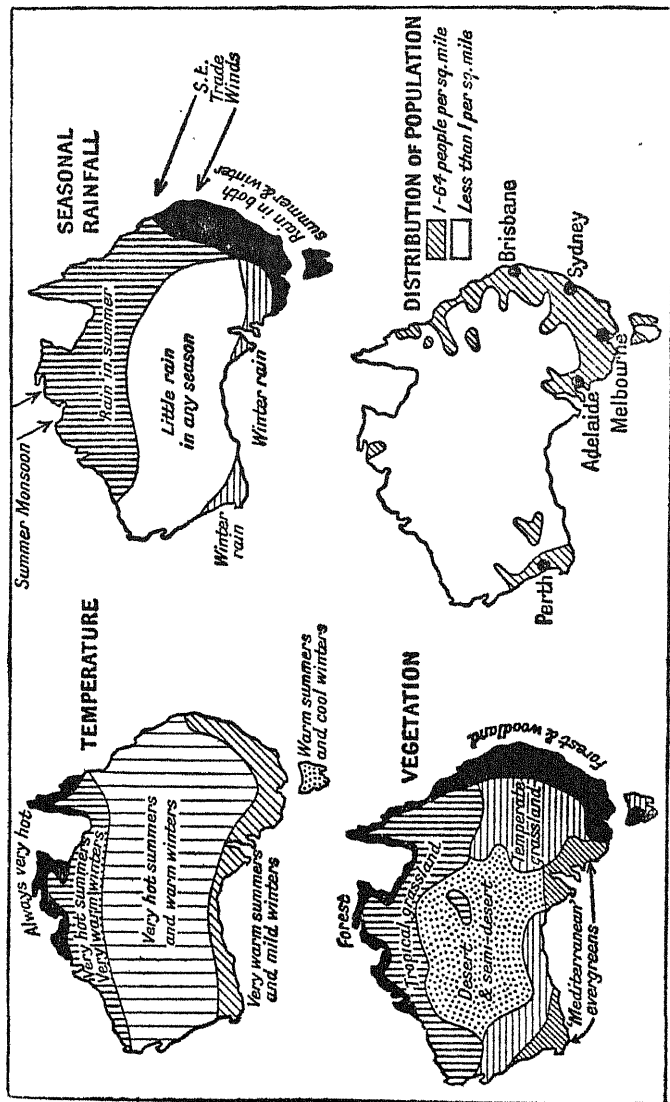


FIG. 121. AUSTRALIA—TEMPERATURE, RAINFALL, VEGETATION, AND POPULATION

rainfall for cultivation, and over the whole area the heat and drought render occupation by the white man difficult. The population of the Northern Territory is, for example, only one per 100 square miles.

3. *The desert region* of the centre and west. Here the rainfall is less than 10 inches per year, and the summers are extremely hot, though the dryness of the atmosphere mitigates the effects of the heat. Though on many maps the whole of this region is shown as desert, there are large areas which may be classed as poor grassland, since they produce scanty vegetation capable of supporting some sheep and cattle.

4. *The Mediterranean region* of the south-western corner around Perth and the south-eastern corner around Adelaide and Melbourne. This region receives rain in winter from the westerly winds and has hot, dry weather in summer. It is, therefore, a region of evergreens, and where cleared and settled produces typical Mediterranean crops such as wheat, vines, and oranges.

5. *The temperate grasslands* of the Murray-Darling basin. Situated in the rain-shadow of the Eastern Highlands, these lowlands receive rather scanty rainfall, and under natural conditions were grasslands. In modern times they have been largely ploughed and utilized for the production of wheat and the rearing of sheep.

6. *Tasmania* lies in the latitude of France, and receives westerly winds at all seasons of the year. It has, therefore, a west European type of climate with rain all the year round and little range of temperature.

FARMING

1. *Wheat.* Australia is one of the chief wheat-growing countries of the world and next to Canada and Argentina is the chief wheat-exporting country. The chief wheat areas are

those parts of the Murray-Darling basin which receive between 15 and 20 inches of rain per year, and the Mediterranean region around Adelaide and Perth.

Noteworthy characteristics of the wheat-growing industry of Australia are (a) the extensive use of machinery, such as

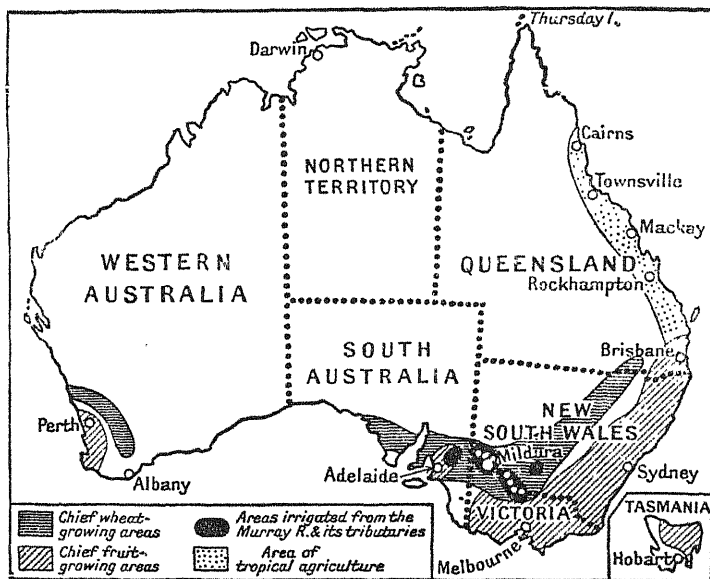


FIG. 122. AUSTRALIA—AGRICULTURE

the combine harvester. (b) The introduction in modern times of special wheats which resist drought and rust. (c) The prevalence of dry farming. (d) The large proportion of wheat which is exported.

2. *Sheep.* Australia is the chief sheep-rearing country of the world. It contains 120,000,000 sheep, produces 27 per cent of the world's wool and 18 per cent of the world's exports of

frozen mutton. The chief sheep lands are (a) those parts of the Murray-Darling basin which have a rainfall varying from 10 to 30 inches. (b) Central Queensland. (c) The moist coastal plain of New South Wales and Victoria. Here breeds of sheep

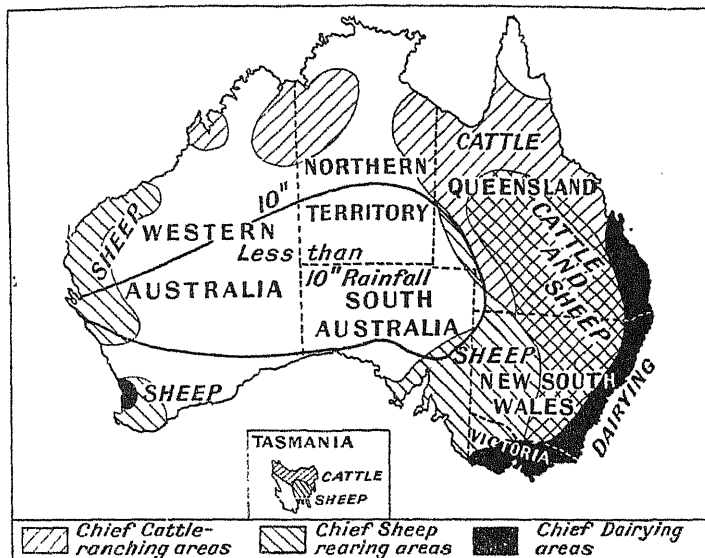


FIG. 123. AUSTRALIA—CATTLE AND SHEEP

which are notable chiefly for producing good mutton rather than wool are reared.

3. *Cattle*. Australia is one of the world's chief cattle-rearing countries, and though she has only about one-tenth as many cattle as sheep, her cattle products are of greater total value than her sheep products.

Ranching is carried on chiefly on the tropical and sub-tropical grasslands of Queensland and northern New South Wales, where artesian wells supply drinking water for the

stock. The chief freezing and canning centres are Townsville, Bowen, Rockhampton, and Brisbane. One great disadvantage of Australia's ranching industry is that the distance to Britain is so great that the beef has to be frozen for transit, whereas the beef from Argentina need only be chilled. It is expected, however, that recently introduced improvements in the method of chilling will enable Australian chilled beef to be marketed in Britain.

Dairying is almost confined to the mild, moist, eastern and south-eastern coast-lands where the cattle can graze all the year round. Nearly half the butter and one-third of the cheese made in Australia is exported, chiefly to Great Britain.

4. *Fruit.* The Mediterranean regions round Perth, Adelaide, and Melbourne, and the moist sub-tropical regions of the east coast, are excellent fruit lands. Oranges, peaches, nectarines, and grapes are the chief fruits. On the coast of Queensland tropical fruits, such as bananas and pineapples, are produced. In Tasmania the chief fruits are apples and pears.

5. *Tropical Plantations.* In eastern Queensland there are numerous plantations of sugar cane and cotton.

6. *Pearling.* Diving for pearl oysters is carried on chiefly around Thursday Island in Torres Strait and Broome in Western Australia. Though some fine pearls are obtained, the industry is carried on mainly for the sake of the shell.

MINING

It was mineral wealth (gold) which first attracted large numbers of people to Australia, and mining still ranks as one of the major occupations of the people. Gold is still the most valuable mineral in respect of total output, and production



CATTLE WATERING
The tank is fed from an Artesian well



Australian National Travel Association
ROUNDING UP SHEEP

has greatly increased in recent years, the value in 1937 being more than twice that of 1931. The chief mining centres are Kalgoorlie, Wiluna, and Murchison, all of which are in Western Australia. *Coal* is mined chiefly around Newcastle and Sydney

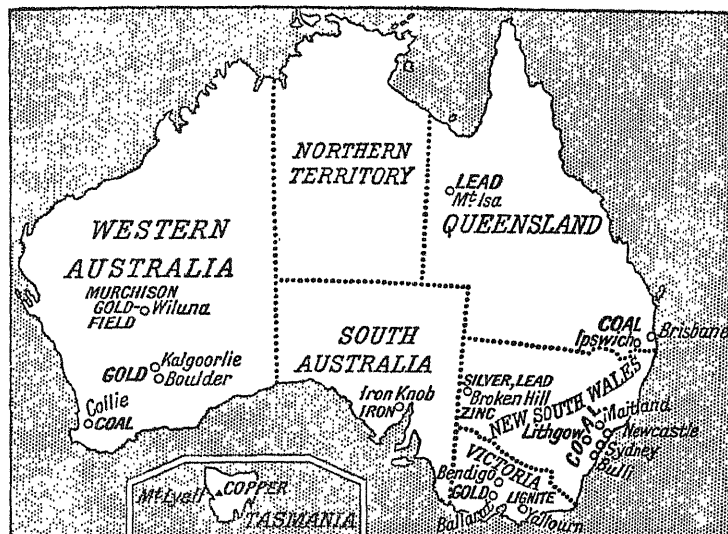


FIG. 124. AUSTRALIA—MINERALS

in New South Wales, and Ipswich in Queensland. *Silver*, *lead*, and *zinc* are generally found together, and are often produced by the same mine. The chief producing centres are Broken Hill in New South Wales and Mount Isa in Queensland. *Copper* is produced at Mount Lyell in Tasmania, *tin* in New South Wales and Tasmania, and *iron* at Iron Knob near Spencer's Gulf.

LUMBERING

The forests of the eastern and south-eastern coast-lands of Australia are composed of various types of eucalyptus trees or 'gum' trees, but few of them are of commercial importance. In the south-west corner of Western Australia, however, there are large stands of *karri* and *jarrah* trees, both of which are of great commercial value. The *karri* is noteworthy for its great strength, and the *jarrah* for its resistance to fire and to salt water. Some *sandalwood* is also obtained from north-western Australia, and some *cedar* from the Queensland coast.

THE GEOGRAPHICAL REGIONS OF AUSTRALIA

1. *Tasmania*. This island state is situated in roughly the same latitude as France and has, therefore, a west European type of climate with rain at all seasons from the westerlies and from 'depressions.' The surface is hilly, or even mountainous, and nearly all the 200,000 inhabitants live on the coastal lowlands of the north and south-east.

Sheep-rearing, fruit farming, and mining are the principal occupations. In the drier south-east sheep farmers specialize in the breeding of high quality 'merinos' for export to the mainland, while the fruit-growers specialize in the production of apples for the British market. The copper mining district of Mount Lyell has already been mentioned.

Hobart, the capital, is situated on a fine harbour at the mouth of the river Derwent, and *Launceston*, the only other town of any size, is situated at the head of the Tamar estuary.

2. *South-eastern Australia*. This region extends from Brisbane to Spencer's Gulf, and includes the following subdivisions (see Fig. 125): (a) The coastal region of New South Wales and southern Queensland; (b) the south-eastern high-

lands; (c) the Victorian valley; (d) the Murray-Darling plains; (e) the 'Mediterranean' part of South Australia, around Adelaide and Spencer's Gulf.

(a) The coastal districts of the east receive abundant rain from the prevalent south-east trades, and the climate is warm enough for plant growth to continue throughout the year.

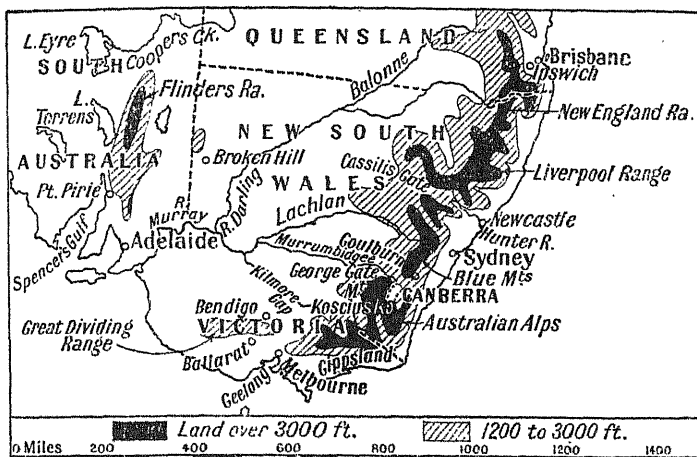


FIG. 125. SOUTH-EASTERN AUSTRALIA

The chief specializations of the farming population are dairying, the raising of sheep for mutton, and fruit-growing. The positions of the towns have been determined chiefly by the existence of good harbours. *Sydney*, the capital of New South Wales, is the oldest and largest city of Australia. Its harbour, Port Jackson, is a many-branched 'ria,' capable of accommodating the largest ocean liners. It is the chief port of the country and is also a great industrial centre. *Newcastle* at the mouth of the Hunter River is concerned chiefly with the export of coal. *Brisbane*, the capital and chief port

of Queensland, is situated at the head of ocean navigation of the Brisbane River, some 25 miles from its mouth.

(b) *The south-eastern highlands* comprise several distinct ranges and plateaus, as shown in Fig. 125. The chief 'gateways' through the highlands are: the Hunter valley, through which the railway from Newcastle runs inland to Bourke on the Darling, and George Gate, through which runs one of the two railways connecting Sydney with Melbourne. It may be noted that the main line from Sydney to Melbourne, through Lithgow and Bathurst, climbs by steep gradients to the plateau of the Blue Mountains and then follows the western edge of the highlands.

Canberra is the Federal capital of Australia, and the seat of the Australian Government. The city is still in course of construction and the present population is only about 7,000.

(c) *The Victorian valley* lies in southern Victoria, south of the Great Dividing Range. The eastern portion, known as Gippsland, is an important dairying region, and is also notable for the production of brown coal (lignite), which is used for the generation of electricity. Port Phillip is a broad bay formed by the submergence of a portion of the Victorian valley. *Melbourne*, the capital of Victoria, is situated at the head of this bay, and at the mouth of the small river Yarra. The largest ocean liners can be accommodated at Port Melbourne, and smaller vessels can dock almost in the centre of the city. From it routes radiate in all directions, the most important being that through the Kilmore Gap to the north of the city.

Geelong, situated at the western extremity of Port Phillip, is a minor port and a woollen manufacturing centre.

(d) *The Murray-Darling plains* may be divided into the following economic regions: (a) The wheat and sheep belt, where the rainfall is from 15 to 25 inches; (b) the dry eastern



Australian National Travel Association
SYDNEY HARBOUR BRIDGE

region with 5 to 15 inches of rain, and given up to sheep-rearing, and 'dry farming'; (c) irrigated areas, such as that of Mildura, which are supplied with water from the rivers Murray and Murrumbidgee; (d) islands of mineral-bearing rocks such as those around Broken Hill and Cobar.

(e) *The gulf region of South Australia.* As this region has a Mediterranean type of climate it is a land of wheat, wool, and fruit. The chief towns are:

Adelaide, the capital and chief port of South Australia; *Port Pirie*, which serves the mining area of Broken Hill; *Port Augusta*, a railway centre at the northern end of Spencer's Gulf; and *Iron Knob*, noted for the mining of iron ore.

3. **Swanland.** This 'Mediterranean' corner of Western Australia specializes in the production of wool, wheat, and fruit, and the extreme south-western portion is notable for the production of jarrah and karri.

Perth, the capital of Western Australia, is situated on the Swan River, 12 miles from its mouth. Its port is *Fremantle*. *Albany*, on a deep, land-locked inlet on the south coast, is the chief timber port.

4. **The Queensland Plantation region.** On the hot, moist, coastal plain between Townsville and Cooktown there are numerous sugar-cane plantations, which are specially noteworthy because they are entirely run by white labour. Tropical fruits such as pineapples and bananas are also cultivated on the coastal plain and a small quantity of high quality cotton is grown in the sheltered valleys south of Rockhampton.

5. **Northern Territory.** The total population of this great territory is about 25,000, and of these only 4,500 are whites, the rest being aboriginals. The chief reason for the scantiness of the population is the unsuitability of the climate. The coastal plain of Arnhem Land receives fairly heavy monsoon rain for a few months in summer, but for the rest

of the year it is so hot and dry that agriculture is almost impossible. Farther south is a large stretch of tropical grassland, but here, too, the long drought precludes agriculture and hinders the development of stock-raising. South of latitude 15° S. the territory is almost absolute desert. *Darwin*, the only town of Northern Australia, has a population of only 1,500. It is visited by coasting steamers, and is an important station on the air-route from India to south-east Australia.

NEW GUINEA

This large island, which forms a physical link between Asia and Australasia, is divided into three parts for purposes of government. The western half is ruled by the Dutch, the south-eastern quarter is definitely Australian territory, and the north-eastern quarter is ruled by Australia under a mandate from the League of Nations.

The Papuans, as the predominant type of natives are called, are a primitive people who, until recently, were very hostile to white men. Some plantations of coco-nuts, rubber, and sisal-hemp have, however, been established, and gold is mined in the interior, communication with the coast being maintained by aeroplane.

Port Moresby, situated on the south coast, is the chief port.

NEW ZEALAND

This small self-governing Dominion of the British Commonwealth of Nations lies 1,200 miles to the south-east of Australia, in the same latitude as France and Spain. As shown in Fig. 126 the principal structural and physical features of the country are:

1. The *fold mountains* which run from East Cape to Cook Strait in North Island and thence, under the name of the

Southern Alps, through South Island. In places the Southern Alps rise well above the snow-line, and Mount Cook (12,350 ft.) is the highest mountain in Australasia.

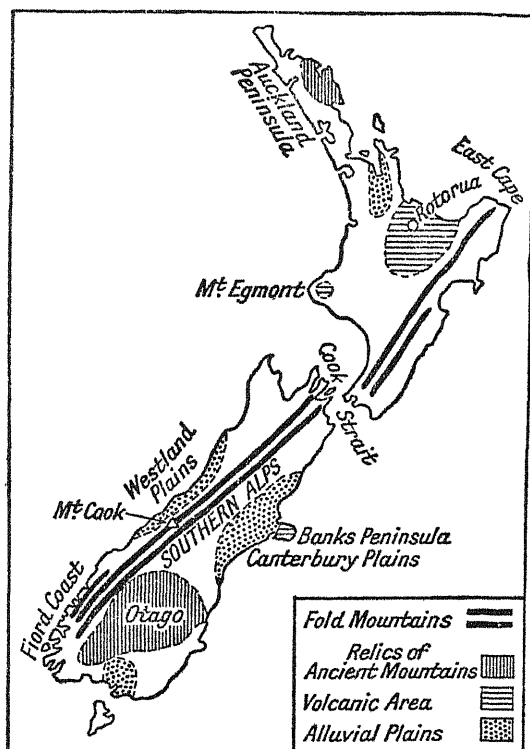


FIG. 126. NEW ZEALAND—STRUCTURE

2. Relics of *ancient mountains* which form the Auckland Peninsula in the extreme north, and the Otago plateau in the extreme south.

3. The *volcanic areas*, chief of which is the Rotorua district

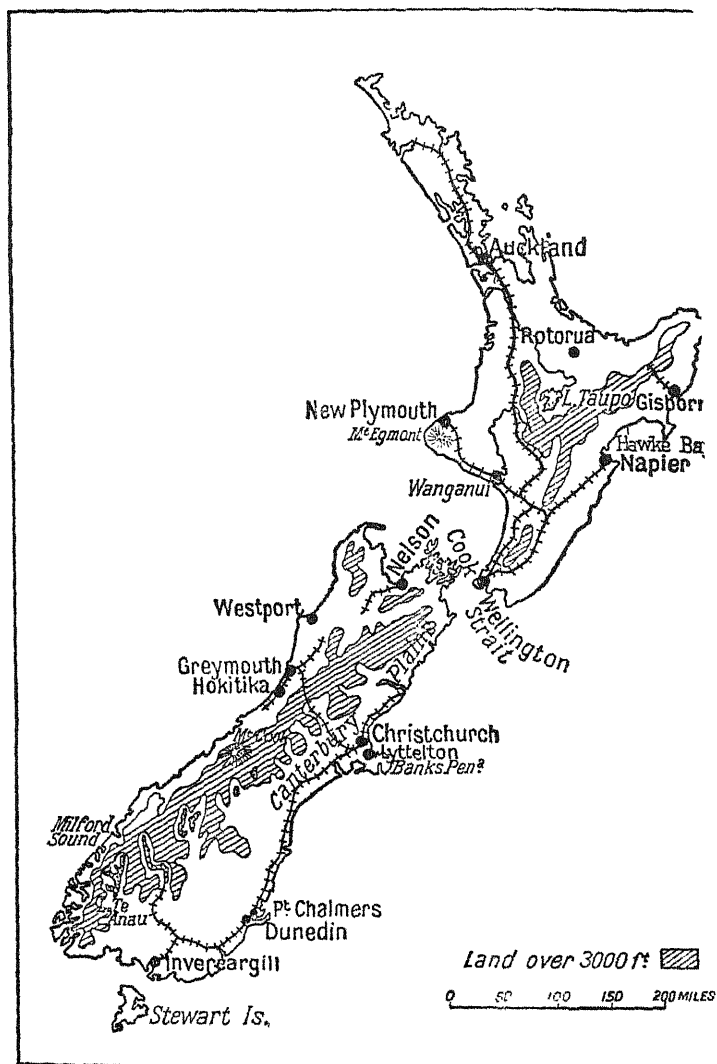


FIG. 127. NEW ZEALAND—PHYSICAL

of North Island, where there are geysers, hot-pools, and mud volcanoes. Mount Egmont in North Island and Banks Peninsula in South Island are of volcanic origin.

4. The *alluvial plains*, the chief of which are the Canterbury plains and the Westland plains in South Island and the Thames valley in North Island.

CLIMATE

South Island is situated in the westerly wind belt, and has, therefore, a west European type of climate with rain at all seasons, mild winters, warm summers, and a low range of

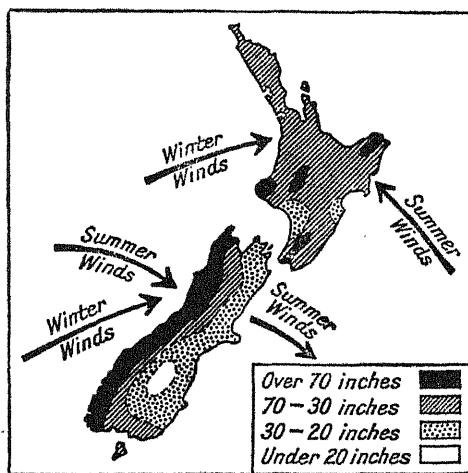


FIG. 128. NEW ZEALAND—RAINFALL

temperature. The moist westerly winds are compelled to rise on encountering the Southern Alps, and so the north-western side of South Island receives heavy rainfall. The Canterbury plains and the Otago plateau are, however, in the rain-shadow, and have less than 30 inches of rain.

North Island is in Mediterranean latitudes and experiences westerly winds in winter and the south-east trades in summer. In both seasons, however, the winds come over the sea and bring abundant rain, thus giving the North Island a modified 'Mediterranean' climate, with rain in summer as well as in winter.

THE OCCUPATION OF THE PEOPLE

1. *Sheep-rearing.* In proportion to its area and population New Zealand is the chief sheep-rearing country in the world, having about 300 sheep per square mile and 20 sheep per person. The most famous sheep-rearing district in New Zealand, and the one to be first developed, is the Canterbury plains of South Island, which produces much wool as well as the famous Canterbury lamb. Other important sheep areas in South Island are the Otago plateau and the coast-lands of Cook Strait. The sheep are chiefly merinos crossed with English stock.

North Island, in spite of its moist climate, has more sheep than South Island. They are, however, chiefly of the Romney Marsh breed, which thrive better in a moist climate than the merino.

New Zealand is the world's leading supplier of frozen mutton and lamb, and one of the chief sources of wool.

2. *Cattle-rearing.* New Zealand is now the foremost dairying country in the world, her exports of butter being exceeded only by those of Denmark, while her exports of cheese are second only to those of Holland.

The great natural advantage of New Zealand as a dairying country is the mildness of the climate, which makes growth of meadow grass continuous throughout the year. This advantage, together with the co-operative system of marketing and government aid to the farmers, has enabled the

industry to overcome the handicap of great distance from the world's markets. Eighty per cent of New Zealand's dairy cattle are in North Island.

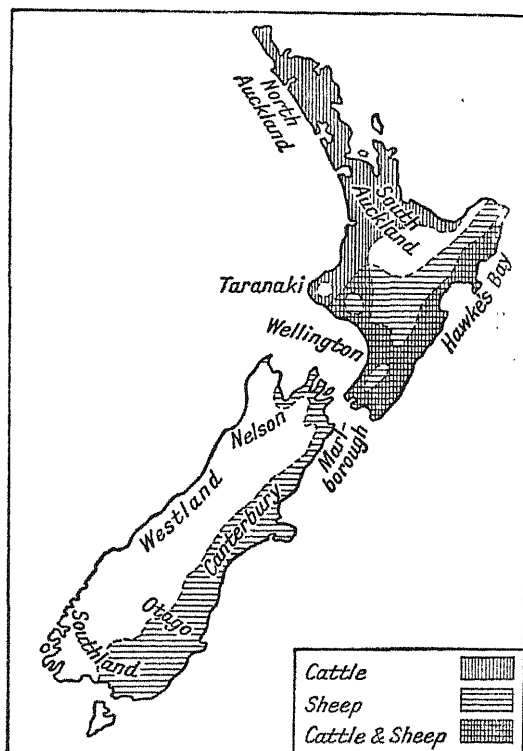


FIG. 129. NEW ZEALAND—CATTLE AND SHEEP

3. *Arable farming.* Wheat is only grown to supply the needs of the country. Practically the whole of the wheat crop of New Zealand is produced in the rain-shadow areas of the Canterbury plains and the Otago plateau.

Oats are grown principally as a fodder crop for the cattle and horses.

4. *Fruit growing.* Abundant sunshine, adequate rainfall, and the mildness of the winters favour fruit cultivation, but distance from the world's markets has hindered the development of the export trade. Apples are exported to Britain, and oranges, lemons, and grapes are grown for home use.

5. *Mining.* Gold is obtained from quartz reefs in the Thames valley of North Island, and from gravels in the valleys of the Clutha and other rivers in South Island.

Coal is by far the most valuable mineral in New Zealand, and the Westland coal-field supplies all the needs of the country. The chief coal-mining centres are Greymouth and Hokitika.

TOWNS

Nearly all the large towns of New Zealand, like those of Australia, are seaports. *Auckland*, the largest city, is situated on a deep, sheltered branch of Hauraki Gulf, on the east coast of North Island. It is separated from the west coast by a narrow isthmus only 5 miles wide. It has a large share in the export of the surplus wool, mutton, and dairy produce of New Zealand.

Wellington, the capital of New Zealand, is situated on the fine land-locked harbour of Port Nicholson, which opens into Cook Strait. Other ports of North Island are Gisborne, Napier, Wanganui, and New Plymouth.

Christchurch, the chief city of South Island, is the only large city of New Zealand which is not a seaport. It is, however, well served by its port of Lyttelton, situated in the lea of Banks Peninsula. *Dunedin* is situated at the head of Otago Harbour, seven miles from the sea. It is accessible by

steamers drawing eighteen feet of water, but large ocean liners have to dock at the outport, *Port Chalmers*.

Invercargill, though only in the same latitude as Southern France, is, with the exception of Magallanes in Chile, the most southerly town in the world. Its outport is Campbelltown (Bluff).

THE PACIFIC ISLANDS

The thousands of islands which are dotted over the South Pacific Ocean are often divided into three groups, according to the type of native inhabitants. *Polynesia* ('many islands') is the term applied to those islands in the triangle formed by the Equator, longitude 120° W., and a line joining New Zealand to Samoa and Hawaii. The Polynesians are tall and well proportioned, with brown skins and black hair. *Melanesia* ('islands of the black') comprises the chains of islands between New Guinea and New Zealand. The Melanesian people, like the negroes, have black skins and black, frizzy hair. *Micronesia* ('the small islands') lies between New Guinea and Japan. The inhabitants are of mixed blood, but are probably descended from Malays.

The climate of the Pacific Islands is characterized by equability and abundant rainfall, the only drawback being the frequency of heavy thunderstorms and destructive hurricanes. The natives generally find it easy to produce sufficient food for their needs—fish, fruit, bananas, coco-nuts, sweet potatoes, etc.—but in spite of a good deal of 'social welfare' work by missionaries and government representatives, the population of many of the islands has diminished in recent years.

Both native and white-owned plantations have been established on many of the islands, the chief products being copra, sugar, bananas, and pineapples.

The principal British islands are: (a) *Fiji*, which is a group of 250 islands, only 80 of which are inhabited. The chief products are cane sugar, coco-nuts, and bananas. (b) *Nauru*, which was formerly German territory and is now governed by Britain under the League of Nations mandate. It is one of the world's chief sources of phosphate rock. (c) The *Gilbert Islands*, a group of coral atolls which produce some copra. The *Solomon Isles* are ruled in part by Britain and in part by Australia under mandate, and *Western Samoa* is under the mandate of New Zealand.

French islands include *New Caledonia*, which produces some nickel and chromium, the *Society Islands*, of which the largest is Tahiti, and the *Marquesas Islands*.

The United States of America rules Hawaii and part of the Samoan Islands. The *Hawaiian Islands* are intensively cultivated, and produce large quantities of sugar and pine-apples, as well as some coffee, bananas, and tobacco. Honolulu, the capital, is the most important trade-route focus in the Pacific, and is an important American naval station.

Other interesting islands are the Juan Fernandez group, on one of which lived Alexander Selkirk whose experiences inspired Defoe to write *Robinson Crusoe*, and Easter Island, noted for its remarkable stone images set up by some vanished race.

Japan was granted a mandate over the Caroline Islands, and retained control of them after she left the League.

CHAPTER XIII

ASIA

GENERAL SURVEY

ASIA is the largest of the continents, occupying, in fact, about one-half of the total land surface of the globe, and containing about one-third of the world's people.

Physically it consists of five major elements, viz.:

1. *The northern lowlands*, which comprise nearly the whole of Siberia and the interior drainage areas of the Caspian Sea, the Aral Sea, and Lake Balkash.

2. *The central belt of mountains and plateaus*. Ranges of fold mountains diverge from the Pamir plateau as shown in Fig. 130. Between these ranges are high plateaus, such as those of Iran and Tibet, and basins of interior drainage such as the Tarim basin and the Turfan basin.

3. *The southern plateaus* of Arabia, Southern India, and Indo-China. These plateaus are detached parts of an ancient continent (Gondwana land) which also included the major portions of South America, Africa, and Australia.

4. *The mid-world trough* which lies between the central folds and the southern blocks. Structurally this trough is a continuation of the Mediterranean hollow, but the major part of it has been filled in with alluvium brought down by great rivers—Tigris and Euphrates in Mesopotamia, Indus and Ganges in northern India, Menam and Mekong in Indo-China.

5. *The eastern and south-eastern festoons*, the loops of islands and peninsulas which form the eastern fringe of Asia, and

which are bounded by the four semi-enclosed seas, viz. the South China Sea, the East China Sea, the Japan Sea, and the Sea of Okhotsk.

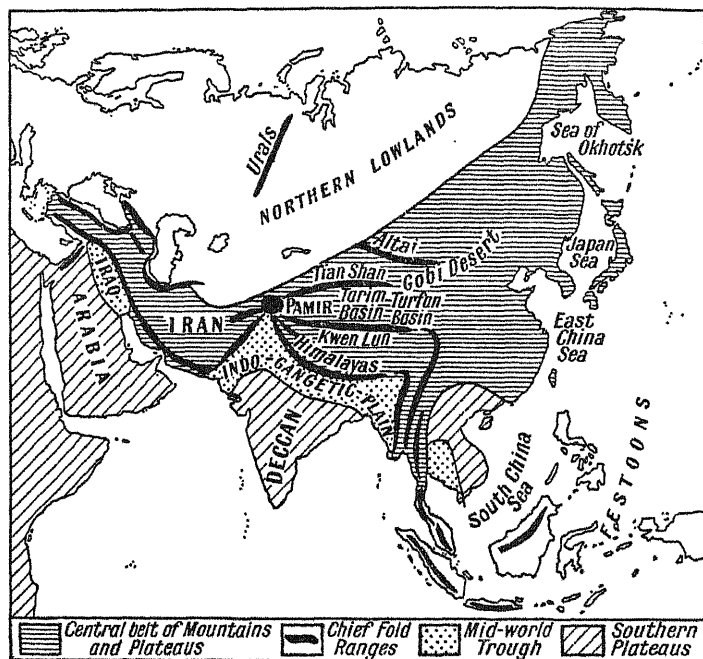
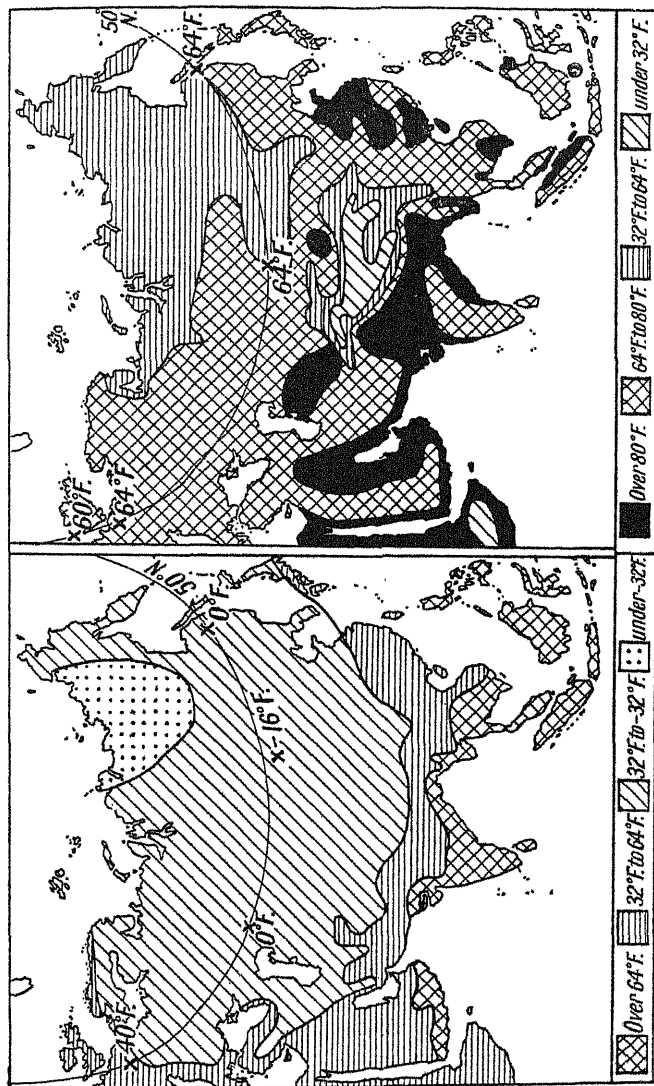


FIG. 130. ASIA—PHYSICAL DIVISIONS

TEMPERATURE

As we have already seen (pp. 20, 21, 74), the interior of Asia is intensely cold in winter. In temperate latitudes (e.g. 50° N.) the west coast of Euro-Asia is comparatively warm, since it receives the mild westerly oceanic winds, as well as the Gulf Stream; the east coast in these latitudes is, however, so cold that the seas are ice-bound for several months, the reason



ASIA—JANUARY TEMPERATURE FIG. 131 ASIA—JULY TEMPERATURE

being that the winter winds blow from the cold continental interior, while the temperature is still further reduced by the cold Kamchatka current.

In July the 64° F. isotherm extends northward almost to 64° latitude, and the greater part of the continent south of the Arctic Circle has warm summers, the only really cool area

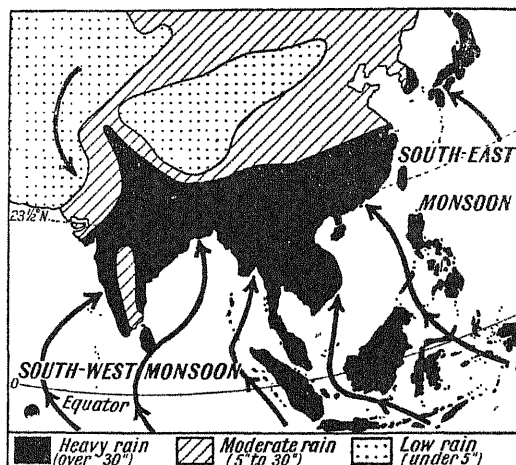


FIG. 132.

SOUTH-EASTERN ASIA—SUMMER MONSOONS AND RAINFALL

being the high plateau of Tibet. The hottest parts of the continent are, however, not those nearest the Equator, but the lowlands situated north of the Tropic, e.g. the Indo-Gangetic plain, the Chinese river plains, Mesopotamia, and the Aral-Caspian depression.

RAINFALL

(a) *Temperate latitudes.* In winter the air over central Asia is cold and heavy, and the winds tend to blow outwards.

The westerly winds which blow over Europe do not penetrate into the cold interior which has, therefore, very little rain (or snow) in winter. In summer, however, the air in the interior is heated and tends to rise, thus allowing the moist westerly winds from the oceans to penetrate and bring some rain. Like all continental interiors, therefore, Siberia receives its

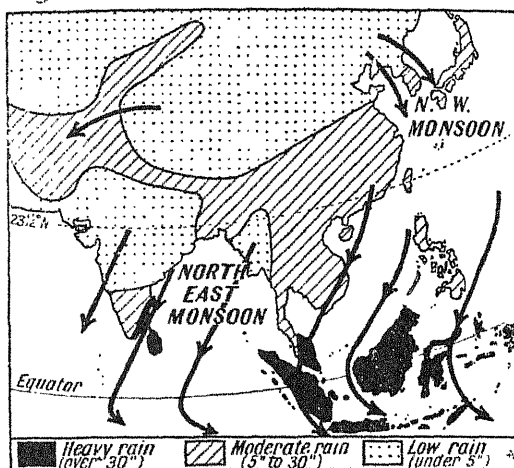


FIG. 133.

SOUTH-EASTERN ASIA—WINTER MONSOON AND RAINFALL

chief rainfall in summer—just when it is of most use to vegetation and crops.

(b) *South and south-eastern Asia.* In winter the outblowing winds may be regarded as the normal north-east trade winds. As these blow from the land to the sea, and from cooler to warmer regions, they are dry, and southern Asia in this season receives little rain except where the north-west winds blow from the sea to the land, as in Ceylon, Malaya, and the East Indies.

In summer the winds are drawn in to the heated interior,

and the rotation of the earth deflects them so that they become the south-west monsoon over India and the south-east monsoon over China and Japan. In both areas these summer monsoon winds are very wet, and deposit heavy rain when they have to rise on encountering the high land.

Ceylon, Malaya, and the East Indies receive rain from the

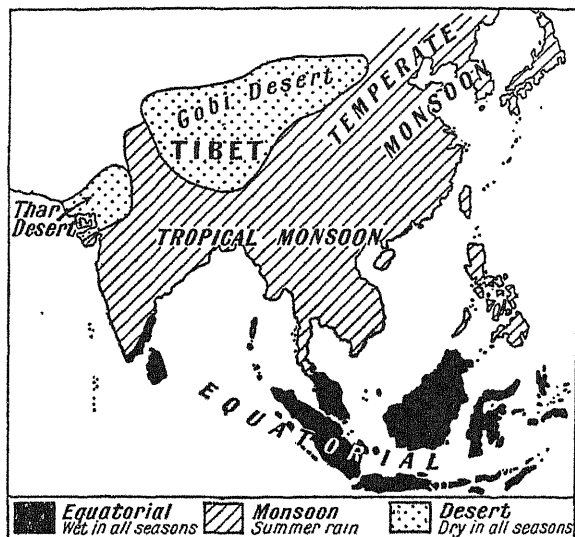


FIG. 134. CLIMATIC REGIONS OF SOUTH AND CENTRAL ASIA

summer monsoon as well as from the winter monsoon. They have, therefore, a 'double monsoon' climate which differs little from the equatorial type of the Amazon basin and central Africa (see page 63).

South-western Asia, on the contrary, has winds from the land in both summer and winter, and is, therefore, mainly desert. The interior plateaus of Asia are so deep in the rain-shadow of their border ranges that they receive little rainfall

even from the indrawn winds of summer. Their great height also is unfavourable to plant life, and they are, on the whole, deserts as inhospitable as the Sahara.

CHINA

The area shown on our maps as China is that which formed the former Chinese Empire. The greater part of this area, however, is now in practice independent of China.

Tibet is a great plateau seamed by high mountains and scored by deep valleys. Most of the land is uninhabited, but some parts support scanty flocks of sheep and a few yaks, and in the valleys are a few oases of cultivation. The total population is only about two millions, and the average density of population is only four per square mile. *Lhasa*, the capital, is situated in a dry sandy plain, surrounded by snow-covered mountains.

Sinkiang is composed of high mountains, broad plateaus, and deep basins. It is practically rainless except on the mountains, and so is absolute desert except where streams, fed by melted snows, irrigate some areas of lowland. In such places are situated the ancient cities of Yarkand, Kashgar, and Yotan. The high Karakoram Pass through the mountains of that name gives access to northern India.

Mongolia. The greater portion of this vast inland territory is a desert plateau inhabited by nomadic tribes who tend horses, camels, yaks, and sheep, and live in movable tents of lattice work and felt. Outer Mongolia is within the orbit of Russia, and Inner Mongolia is largely under Japanese control. The total population of the two areas is only about three-quarters of a million, but as the region is of great strategic importance, and is probably also rich in minerals, its control is the subject of rivalry between Japan and Russia.

Manchuria (Manchukuo) is the only one of the former outlying provinces of China which is at all densely peopled. It has rich fertile soil, and in spite of the extremely cold winters is capable of producing large crops of wheat, maize, and soya beans. It is also rich in copper, iron, and other minerals. During the present century it has been extensively colonized by Chinese immigrants from the famine-stricken areas of the Hwang-ho. In 1928 Manchuria received 1,000,000 such immigrants, and for several years before that it received an average of half a million per year.

Japan had long coveted control of the region in order to draw from it the minerals and raw materials which she cannot produce at home, and at the same time to make it a closed market for the export of her own manufactured goods. In 1931, in spite of the opposition of America and the League of Nations, she made the weakness of the Chinese government an excuse for military operations, which eventually gave her sole control of Manchuria. The province is now named Manchukuo, and its puppet government is entirely controlled by Japan.

Dairen (Port Arthur) is the largest port of the region. It was taken from Russia by Japan during the Russo-Japanese war of 1905. It is the terminus of the Chinese Eastern Railway, which branches from the Trans-Siberian Railway and which was built by Russia as her chief outlet from Siberia. This railway was sold to Japan in 1937.

Harbin and Moukden are important railway and manufacturing centres.

China Proper. In contrast to the above-mentioned regions China proper is one of the most productive and most densely peopled areas of the world, containing, in fact, about 420,000,000 people or about one-fifth of the total population of the earth. This vast territory consists mainly of the basins of three

important rivers—the Hwang-ho, Yang-tse-kiang, and the Si-kiang, and its geography is most conveniently studied on the basis of these three rivers.

THE HWANG-HO BASIN

The Hwang-ho rises in Tibet and flows through Mongolia before entering China proper. In its middle course it forms three sides of a rectangle, the southern side of which is formed by the important tributary Wei-ho. This region is built of a yellow deposit known as *loess*, which represents the accumulation, through endless centuries, of dust blown outwards from central China. The loess is very porous, and as the middle basin does not receive very heavy rainfall the greater part of the region is uncultivated. The term 'loess' is, in fact, derived from the German word meaning 'loose' or 'porous,' and the loess is so 'loose' that the streams have easily carved out of it many deep, straight-sided gorges. The alternative name of the Hwang-ho—Yellow River—owes its origin to the colour of the silt-laden water. The roads, which centuries ago started on the level of the plateau, have been worn down until they are at the bottom of deep gorges. Houses, sometimes with two or more stories and fitted with doors and windows, are often excavated from the sides of the loess cliffs. Water quickly soaks through the loess leaving the surface of the plateau dry and barren, but in the river valleys where plenty of water is available it is very fertile and yields great harvests of wheat, cotton, and vegetables. When the Hwang-ho reaches the plain, part of this yellow mud is deposited, thus building up the bed of the river above the level of the surrounding land. This makes irrigation easy, so the plain of the Hwang-ho is very densely peopled, but the raising of the river bed increases the danger of floods. Every few years floods drown thousands of people and render tens of thousands

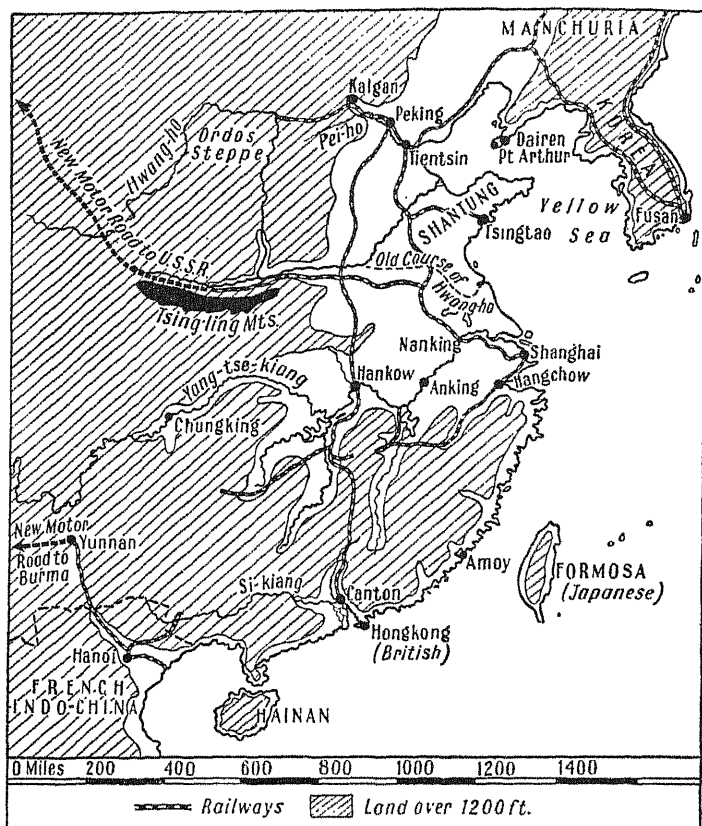


FIG. 135. CHINA—PHYSICAL, TOWNS, AND RAILWAYS

homeless, and once every ten years or so there is a flood which affects a million or more people. In 1861 the Hwang-ho burst its banks and drowned over a million people, besides rendering millions more homeless and destitute. Well may the river be called, 'China's sorrow.'

The basin of the Hwang-ho has an extreme climate, with intensely cold winters and very hot summers. Practically all the rain falls in summer when the south-east monsoon blows from the Pacific. These climatic conditions suit the cultivation of wheat rather than rice, which is not grown to any great extent in northern China. In addition to wheat the chief food crops are millet, maize, and vegetables. The mineral wealth of northern China is very great, though not much exploited at present. The coal-field of Shansi, for example, contains about 100,000 million tons of coal or about five hundred times as much as is produced each year in Britain.

Peking on the Pei-ho was the capital of China from 1368 to 1928. It is the centre of the railway system of northern China, and seems likely to become the capital of that part of China which has fallen under Japanese control.

Tientsin, the port of Peking, is situated at the head of ocean navigation of the Pei-ho. *Tsingtao* is the outlet for the province of Shantung. It was formerly a German possession, but was taken by Japan in the Great War of 1914-18, handed back to China in 1919, and again occupied by the Japanese towards the end of 1937.

YANG-TSE-KIANG BASIN

The Yang-tse-kiang rises in Tibet not far south of the Hwang-ho. Its upper course is through deep gorges in unexplored and practically uninhabited mountainous country. The part of the basin within China proper is divisible into three parts:

(a) **The Red Basin of Szechwan**, so called because of the reddish soil which covers most of the area. Here the comparative mildness of the climate, the frequency of rain in both winter and summer, and a wonderful system of irrigation which

was developed many centuries ago, combine to produce a region of great fertility. The crops vary according to the elevation. Rice and silk are grown on the valley floors, maize and wheat on the lower hill slopes, and oats and potatoes at greater elevations. *Chungking* in the centre of the basin is the chief city. Below the Red Basin the Yang-tse-kiang passes through a series of gorges. In summer when the river is swollen by the melting snows, steamers can reach Chungking, but in winter only native junks can navigate the gorges, and even these have to be pulled over rapids by gangs of trackers. Below Ichang the valley opens out to—

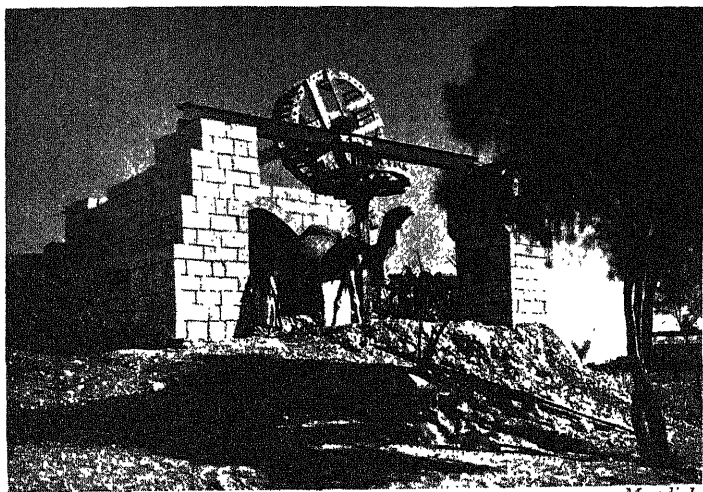
(b) **The Central Basin.** This is an extensive plain watered not only by the Yang-tse-kiang but also by several great tributaries which form important lines of communication. This plain is one of the most densely peopled areas of China. Rice is the dominant crop of this lowland, as indeed of all the lowlands of central and southern China, while cotton, tea, and silk are also of primary importance. *Hankow*, which is strictly speaking only one of three cities situated at the confluence of the Yang-tse-kiang and the Han-ho, is the commercial centre of the region. It has important iron and steel manufactures, and though it is 600 miles from the sea it is accessible by large ocean liners during the high water in summer, and by sea-going vessels of 4,000 tons at all times.

(c) **The Delta Region.** This is a great alluvial plain extending northwards to link up with the Hwang-ho lowland. Here the average size of the farms is less than two acres, and the agricultural population is over 2,000 per square mile. In addition, many millions live in the great cities and millions more live in boats on the rivers. *Nanking*, with a population of half a million, was the capital of China from 1928–37, when it fell before the invading Japanese armies. *Shanghai*, the greatest port and commercial centre of China, is situated, not



Donald Mennie

TRACKERS ON THE YANG-TSE



Mondiale

DESERT WATER-WHEEL, BEERSHEBA

on the Yang-tse-kiang, but on the Woosung Creek. Though developed mainly by the British as a treaty port, i.e. an area which China had been compelled to set apart as a centre of foreign commerce, its population of $1\frac{1}{2}$ millions is mainly Chinese.

THE SI-KIANG BASIN

Southern China, drained chiefly by the Si-kiang, differs from the rest of China in having very warm winters, and for this reason it has a greater variety of crops than central and northern China. In addition to rice, tea, and silk, such tropical products as pineapples, ginger, and bananas are grown.

The province of Yunnan, which is drained by the upper course of the Si-kiang, is a region of high mountains, broad plateaus, and deep valleys. It is rich in tin, tungsten, and other minerals. A motor road has recently been constructed from the capital, *Yunnan*, to the rail-head on the Burmese border (see Fig. 135.)

Canton, the great city on the delta of the Si-kiang, has a population of $1\frac{1}{2}$ millions, about a third of whom live in boats. It is the southern terminus of the great central railway of China which runs through Hankow to Peking.

Hongkong, which, until the recent Japanese occupation of China, dominated the trade of southern China, is a small granite island opposite the mouth of the Si-kiang. Included within the territory of Hongkong is a narrow strip of the mainland known as Kowloon. From it a railway runs inland to Canton. The magnificent harbour between Hongkong and Kowloon can be used by ocean steamers at all times, and this gives the port a great advantage over Canton, which cannot be reached by large vessels. In 1930 it was the third port of the world, by value of its trade.

TRANSPORT IN CHINA

Throughout China coolies, who carry loads strapped to the back or supported from opposite ends of a bamboo stick, are the chief transport animals of China. In central and southern China the wheelbarrow, really a one-wheel cart, is almost the only vehicle used for transport. Using one of these carts one man can transport five or six hundredweight over roads which are usually merely paths. In north China the two-wheeled cart drawn by mules or buffaloes is mainly used. The Chinese also make great use of rivers and canals which are navigated by junks and sampans. Railway development has been hindered by lack of capital and by the unsettled state of the country. A great trunk line has, however, been built from Peking to Hankow and Canton, and another one from Peking to Nanking. Other railways link up these north to south lines with the ocean ports (see Fig. 135).

JAPAN

Japan proper consists of a group of large islands—Yezo, Honshu, Shikoku, and Kyushu—together with thousands of smaller ones on the eastern side of Asia between latitudes 30° N. and 50° N. The Japanese Empire consists of the above group of islands together with the southern half of Korea and Formosa. The former Chinese province of Manchuria was taken by Japan in 1931 and is now in effect a part of the Japanese Empire. In 1937, Japan, without declaring war, invaded China, and after a ruthless campaign established control over a considerable part of the country.

The mountains which run like a backbone through the middle of the islands of Japan proper, slope steeply to the sea and off the eastern coast is the Tuscarora Deep, one of the

deepest parts of the ocean (minus 28,000 feet). The bed of the sea in this region is still sinking and each slight movement causes earthquakes. Japan has on the average four distinct earthquake shocks per day, and from time to time suffers shocks of great intensity such as that of 1923 which resulted in the destruction of the capital Tokio, and the loss of thousands of lives.

Though Japan proper lies in the latitudes of Spain and France the climate is very different from that of southern Europe. In summer the south-east monsoon blows from the Pacific Ocean and in this season the climate is hot and wet. In winter Japan experiences the north-west monsoon which is cold as it blows from the 'cold pole' of Asia. In the northern half the winds are bitterly cold, and even the southern half has long spells of cold weather.

The mountain slopes in Japan are barren and uncultivated, and the agricultural land is almost entirely confined to small alluvial 'bays' of lowlands between the mountains and the sea. The cultivable land of Japan is less than one quarter of the total area, and though during the last hundred years productivity has been doubled, it is impossible for the Japanese farmers to produce sufficient food for the 60,000,000 inhabitants. The difficulty of food supply is further accentuated by the fact that the population of Japan is increasing at the rate of nearly one million per year. The average size of a farm in southern Japan is only two acres, and though the Japanese are among the most skilful and industrious farmers in the world they rarely produce enough for themselves and their families.

Rice is the principal crop of southern Japan and occupies nearly half of the cultivated land. In addition to other food crops such as peas, beans, and vegetables, each peasant family produces some money crops, the chief of which are tea and silk.

Fishing is of the highest importance in Japan partly because the sea is rich in fish and partly because the farm land cannot be spared for the rearing of animals for meat. At least $1\frac{1}{2}$ million people are engaged in the fishing industry, and the total weight of fish landed is greater than in any other country. Another important modern industry is the gathering of seaweed which is cultivated for food on an extensive scale.

INDUSTRIAL DEVELOPMENT

Partly in order to be able to buy food from abroad, and partly in order to establish her position as a great power, Japan long ago decided to become a great manufacturing country. Young men were sent out to Europe and America to study methods of manufacturing, and on their return built factories and railways, ports, etc. in Japan.

There are in Japan two types of factories—small workshops with little equipment and only four or five workers, and huge modern factories equipped with the most up-to-date machinery. In the small factories men and children work for twelve to fourteen hours a day for an average wage of about 3s. per day for the men and a few pence per day for the children. The large factories are engaged chiefly in the production of cotton goods. The great majority of the workers in the cotton factories are girls who are brought from the country districts and engaged under contract for a period of years. In these factories conditions of life and work are on the whole good, according to Eastern standards, though the wages paid are low in comparison with our own.

The following points should be noted in connection with the industrial development of Japan:

1. The Japanese live very simply and wages which would be quite insufficient for Europeans may maintain them in comfort.

2. Hydro-electricity generated from mountain streams provides power, and, in addition, Japan has sufficient coal for her present needs.

3. Factories alone are not sufficient to ensure the success of Japan's policy of industrialization; in addition, she requires raw materials and markets for her finished productions, and China with its population of 400,000,000, and its huge untapped reserves, offers both raw materials and the markets. and it was, no doubt, to control these that Japan attacked and defeated China in 1931 and again in 1937.

CITIES OF JAPAN

Tokio, the capital, is situated at the head of a broad bay in the main island of Honshu. It specializes in the manufacture of small metal goods and electrical apparatus.

Yokohama, the chief port of Japan, is situated on Tokio Bay some twenty miles from the capital.

The chief industrial cities are situated on the coast of the Inland Sea which lies between the islands of Honshu, Kyushu, and Shikoku. *Osaka* is the centre of the cotton industry. *Kobe* is the second port of Japan and manufactures matches and rubber goods. *Nagoya* is the chief centre for the manufacture of pottery, and is also engaged in the production of various textiles.

JAPANESE POSSESSIONS

The island of *Formosa* was taken from the Chinese in 1895. The bulk of the inhabitants are still Chinese, the Japanese being engaged principally as administrators and merchants. The principal products are rice, sugar, tea, and camphor.

Korea was annexed by Japan after the successful war against Russia and produces much rice, most of which is sent to Japan. Other products are silk, cotton, and tobacco.

Karafuto, which is the Japanese name for the southern part of Sakhalin, remains thinly peopled because of its inhospitable climate. It is, however, of very great importance as a source of fish and timber.

Manchukuo has already been dealt with on page 260.

INDO-CHINA AND THE EAST INDIES

Indo-China is the peninsula which lies between China and India and includes Burma, the Malay Peninsula, Siam, and French Indo-China. The mountain ranges, which are the dominant physical feature of the region, splay out fanwise from the extreme north of Burma. Between the ranges are the long narrow valleys of the rivers Irrawaddy, Salween, and Mekong. Climatically, Indo-China is of the monsoon type, and receives heavy rain in the summer from the south and south-west monsoons, while in winter the north-east monsoon brings rain only to the eastern side of French Indo-China and to the Malay Peninsula. The Malay Peninsula and East Indies have an equatorial type of climate, with rain at all seasons—in summer from the south and south-east monsoon, and in winter from the north and north-west monsoon.

BURMA

Though sometimes spoken of as Further India, Burma is an entirely separate country. It is completely shut off from India by the mountains of the north-west, and the people are very different from the Hindus; consequently, when in 1935 India was given a large measure of self-government, Burma was recognized as an entirely separate country, though it remains, of course, part of the British Empire.

Physically, the country consists of parallel ranges of moun-

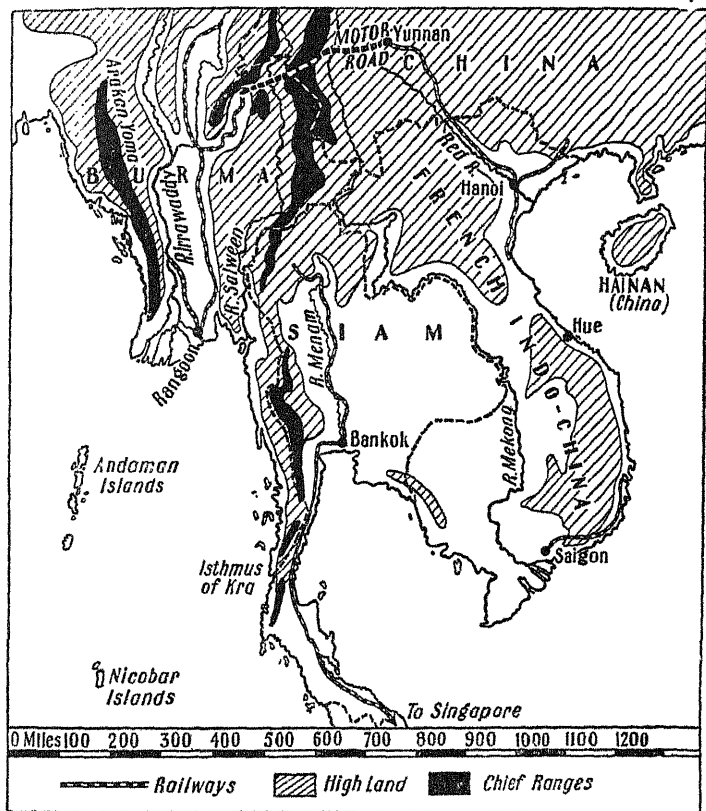


FIG. 136. INDO-CHINA

tains running north to south, between which are broad valleys. The chief river is the Irrawaddy, which rises near the Chinese boundary and flows to the sea at the great port of Rangoon.

Like India, Burma has a monsoon type of climate though the interior lowlands are in the rain-shadow, and so receive much less rain than the coastal regions.

The chief product of the hot, moist, coastal regions is rice, and as the density of population in Burma is not so great as in the Ganges basin there is considerable surplus of rice for export. *Rangoon*, the capital of Burma, is, indeed, the chief rice-exporting port of the world. Other important cities are *Moulmein*, a port at the mouth of the Salween River, and *Mandalay*, the ancient capital situated in the centre of the interior lowlands.

SIAM

Siam is the only independent kingdom in south-eastern Asia. The most productive part of the country is the central plain which is drained by the river Menam, and is devoted chiefly to the production of rice. *Bankok*, at the mouth of the Menam, is the capital and only port of Siam.

FRENCH INDO-CHINA

This region consists of two river basins—that of the Mekong in the south and that of the Red River in the north, with an intervening ridge of mountains. Rice is the principal agricultural product, and, as in Burma, the rather low density of population allows a considerable export of this commodity. *Saigon*, the chief port, is accessible by large ocean steamers, and conducts a very large percentage of the total foreign trade of the country.

MALAYA

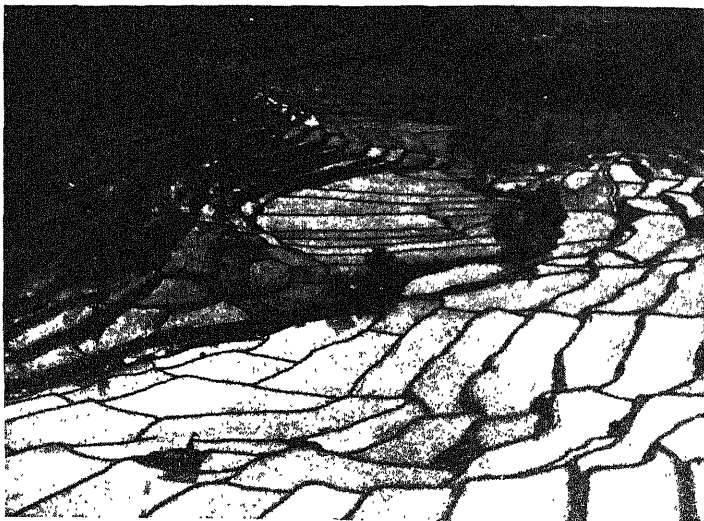
The Malay Peninsula comprises three political divisions, all of which are under British control, and which are known collectively as Malaya. They are:

1. *The Straits Settlement*, which includes the island of Singapore and the district of Malacca on the mainland.
2. *The Federated Malay States*, a group of small native states under British control.



TAPPING RUBBER TREES

Federated Malay States



RICE-FIELDS IN JAVA

Mondiale

3. *The Native States*, which, although not included in the Federation, are under British direction.

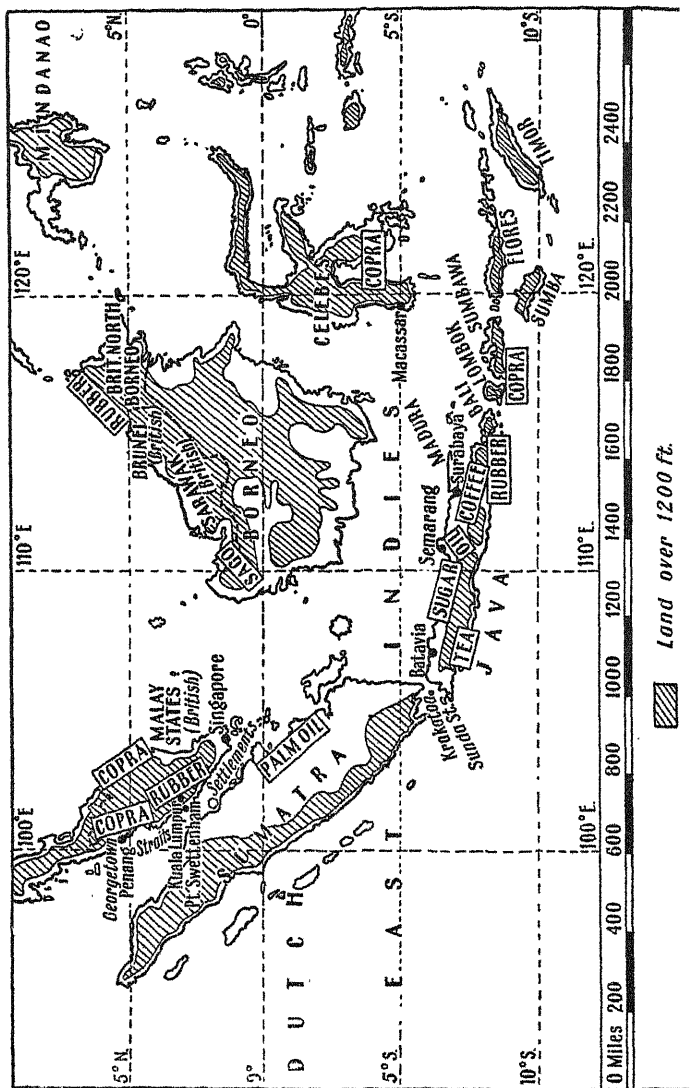
The interior of the peninsula is a tropical forest region inhabited by nomad tribes who, like the Pygmies of the Congo basin, depend on hunting, fishing, and the collecting of wild products. The Malays live chiefly on the western coastal plain, rice being their chief food crop.

Rubber plantations, chiefly owned by Europeans and worked by native hired labour, are the chief source of wealth. In fact, Malaya produces 40 per cent of the world's rubber. *Coco-nuts* are cultivated on both native and white-owned plantations, which are situated principally on the sandy coastal plain. Malaya supplies about 8 per cent of the world's copra. *Tin*, next to rubber, is the chief export of Malaya. The ore is found mixed with gravel in the river valleys, and the mixture is scooped out by huge dredgers and washed in strong currents of water which sweep away the lighter gravel and leave the ore.

Singapore, situated on the island of the same name at the southern end of the Malay Peninsula, is one of the world's greatest trading centres, being situated at the junction of the routes from Europe to the Far East, and from India to Australia. It is a great entrepôt and coaling station, and as a naval station is the basis of British power in the Far East.

THE EAST INDIES

Structurally the East Indies are a continuation of the fold mountain system of Asia (see Fig. 130). Climatically they are of the equatorial type, with high temperature at all seasons and rain all the year round. Politically they belong to the Dutch Empire, with the exception of Sarawak (the north-western part of Borneo) and the eastern half of New Guinea, which are part of the British Empire.



The islands vary greatly in the extent to which they have been developed by European methods.

Java is the most densely peopled tropical island of the world. The high productivity of Java is due partly to the fertile soil and to the hot, moist climate, but the fact that the population has increased tenfold since 1800 indicates that the present prosperity is due more to the energetic direction of production by the Dutch than to natural advantages. Almost every tropical product of importance to commerce is produced in the island—rubber, tea, coffee, coco-nuts, cocoa, sugar, spices, and cinchona (the bark from which quinine is extracted) are the chief specialities.

On the northern side of the island there is a large oil-field which yields about 3 per cent of the world's oil. On this coast, too, are situated all the large towns, including *Batavia*, the capital and chief port.

Sumatra, though three times the size of Java, has only one-sixth as many people. In recent years, however, the plantation system has been introduced with success, especially for the cultivation of rubber, palm oil, tea, and tobacco.

The Dutch East Indies supply about one-third of the world's rubber, one-third of the world's copra, and one-sixth of the world's tin.

THE PHILIPPINE ISLANDS

These islands were ceded to U.S.A. by Spain in 1898, but in recent years the Philipinos, as the native inhabitants are called, have been granted a large measure of self-government, and promised complete independence in the near future.

The chief exports are cane sugar, copra, and manila hemp, the last-named being a fibre produced from a native plant belonging to the banana family. It is used chiefly for the manufacture of ropes.

Manila is the capital and chief port of the Philippines.

CHAPTER XIV

ASIA (*continued*)

INDIA

THIS vast country consists of two triangles on a common base which roughly coincides with the Tropic of Cancer. The greatest width of the country measured along the common base is approximately 1,650 miles, and the greatest length, apex to apex, is about 2,000 miles. The total area of the country is roughly equal to that of Europe without Russia, and it contains 350 million people, or about one-sixth of the world's population.

The build of the country is very simple. It is cut off from the rest of Asia by a series of high mountain walls—in the north-west the Sulaiman and Hindu Kush, in the north the Himalayas, and in the east the Arakan Yoma. Within this mountain rampart is the *Indo-Gangetic plain*, so called because it is drained by the rivers Indus and Ganges. Once this plain was a great trough occupied by the sea, but innumerable rivers flowing from the Himalayas brought down such vast quantities of silt that the sea was gradually filled up and the present plain formed.

The Indus has given its name to the whole of the country. In the language of the Aryan peoples who invaded India from the north-west three or four thousand years ago, the word 'Indus' meant 'river' or 'flood.' It was first applied to the river, then to the land drained by the river, and finally to the whole country.

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South of the Indo-Gangetic plain is the great plateau of

hard old rocks known as the *Deccan*. Ages ago this plateau was not linked to Asia but to Africa and Australia. Some geologists, indeed, think that all the southern continents were once close up to each other, and that they have drifted to their present positions. Either this is so or huge blocks of land between Africa, India, Australia, and South America must have sunk below the level of the sea, since the similarity of these southern continents leaves no doubt that they were once joined together.

We have already noted that the climate of India is of the monsoon type (see Fig. 134). In winter the monsoon blows from the north-east. It does not, however, come from the centre of Asia as the Himalayas prevent any current of cold air reaching India. The country has, therefore, no real winter, though the period from December to February is called the 'cool season,' in contrast to the very hot, dry season which lasts from March to June, and to the hot, wet season which lasts from June to December. As the north-east monsoon blows from the land it brings little rain to India, though Ceylon and the extreme southern tip of the peninsula receive some rain from the winds which have blown over the Bay of Bengal (see Fig. 133).

The south-west monsoon which bursts over India in June owes its origin to the very high summer temperatures over north-west India. Here, the heated air rises and winds from the Indian Ocean are drawn in. The rotation of the earth causes these winds to circulate in an anti-clockwise direction, so that over the Western Ghats the winds come from the south-west, in Bengal from the south, and in the Ganges basin from the south-east. In this season heavy rain is experienced all over India except in the north-west. Exceptionally heavy rain is experienced in those districts in which the monsoon winds, blowing direct from the sea, are

compelled to rise suddenly on encountering mountain ranges, e.g. the Western Ghats, the Himalayas, and the Khasi Hills.

Cherrapunji, in the last-named district, has the heaviest recorded rainfall in the world, an average of 457 inches. Each week in July has 25 inches of rain, which is as much as falls in the whole year in eastern England.

The Deccan is in the rain-shadow of the Western Ghats and so receives less rainfall than the west coast and the Ganges basin. Moreover, the rainfall varies greatly from year to year. In years of specially low rainfall this region suffers from terrible famines, such as the one from 1866 to 1869, during which one and a half million people and three million cattle died. In modern times crop famines still result in serious hardships, but actual famine is prevented by the transport of food from other districts of India.

PHYSICAL DIVISIONS

The Mountain Wall. The Himalayas are the highest mountain range in the world, the chief peaks being Everest (29,000 feet), Kanchinjunga (28,000 feet), and Dhaulagiri (26,800 feet). The Himalayas have proved of great value to India in the following ways: (*a*) They are a barrier against invasion from the north. (*b*) As already noted, they shut out the cold winds from the north. (*c*) The waste rock produced by the weathering of the mountains has built up the Indo-Gangetic plain, and its fertility is renewed every year by fresh deposits of silt. (*d*) The heavy rain of summer, and the melting snows and glaciers, feed innumerable rivers which provide water for irrigation and, in modern times, hydro-electricity.

The mountains which separate India from Burma consist of several parallel ranges through which there are no low passes, and consequently no roads or railways.

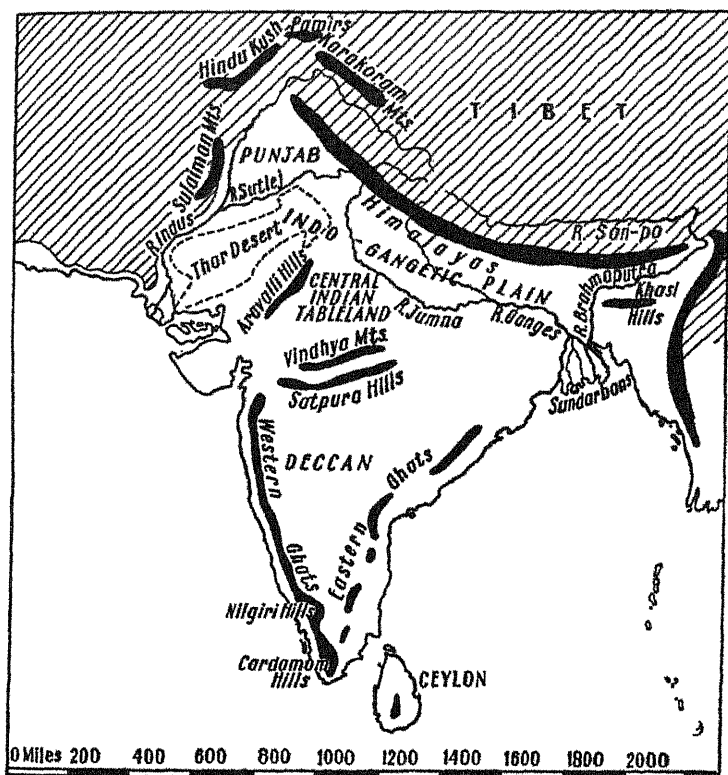


FIG. 138. INDIA—PHYSICAL

The North-west Frontier comprises the Hindu Kush and Sulaiman mountains and the foothills to the east. These mountains are not nearly so high as the Himalayas, and they are crossed by many passes through which in former times invaders have entered India. The chief of these are the Khyber Pass and the Bolan Pass. The inhabitants are the Pathans to whom the raiding of caravans and lowland

settlements is an honourable tradition. *Peshawar* is a fortress station guarding the entrance to the Khyber Pass.

The Indo-Gangetic Plain. The Indus rises north of the Himalayas in Tibet and for the first 600 miles flows through almost uninhabited mountain plateau and gorges. In the Indian state of Kashmir, however, it enters the broad fertile vale of Kashmir whose capital, Srinagar, is one of the most picturesque cities of India. Near Attock, which marks the limit of boat navigation, the Indus receives the tributary Kabul which flows parallel to, though not through, the Khyber Pass. In its lower course the Indus is subject to frequent floods and to frequent changes of course which prevent navigation and the growth of towns on its banks.

The Punjab is the land drained by five rivers whose waters eventually flow to the Indus (*pun*=five, *ab*=land between rivers). This region has a rather low rainfall, but has been rendered extremely fertile by the construction of irrigation canals which are fed from rivers and reservoirs.

The Ganges rises in the Cow's Mouth, a cave in a Himalayan glacier. Its chief tributaries are the Jumna, the Gogra, and the Gandak on the north bank and the Son on the south bank. The Ganges basin is the most fertile and most densely peopled part of India. It owes its fertility to the deep rich soil, the heavy summer rainfall, the high temperatures, and abundant supplies of water for irrigation.

The Brahmaputra rises in Tibet. Throughout its course in Tibet it is known as the San-po, but farther on it breaks through the Himalayas by a great gorge below which it receives the name Brahmaputra. The Ganges and the Brahmaputra have together built up a huge delta which forms the greater part of the province of Bengal.

The Thar Desert lies south of the Punjab and north of the great shallow lagoon known as the Rann of Cutch. In winter

the dry north-east monsoon brings dry weather to the Thar region as to the rest of India, while in summer the winds blow from the north-west and are also dry. Thus the Thar region receives practically no rain.

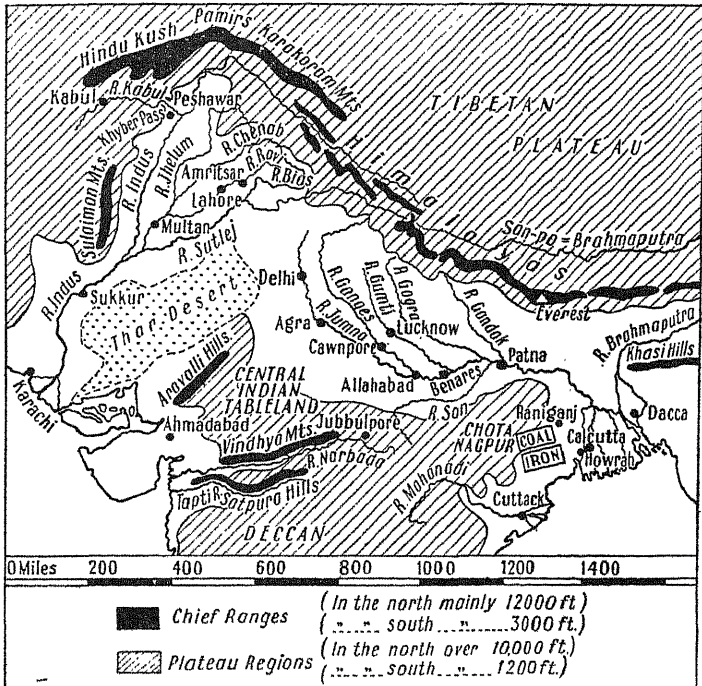


FIG. 139. NORTHERN INDIA

The Central Indian Plateau. This region lies between the Aravalli Hills and Vindhya Mountains, and though suffering to some extent from lack of moisture, it receives sufficient rainfall for cultivation of crops and is, therefore, fairly densely peopled.

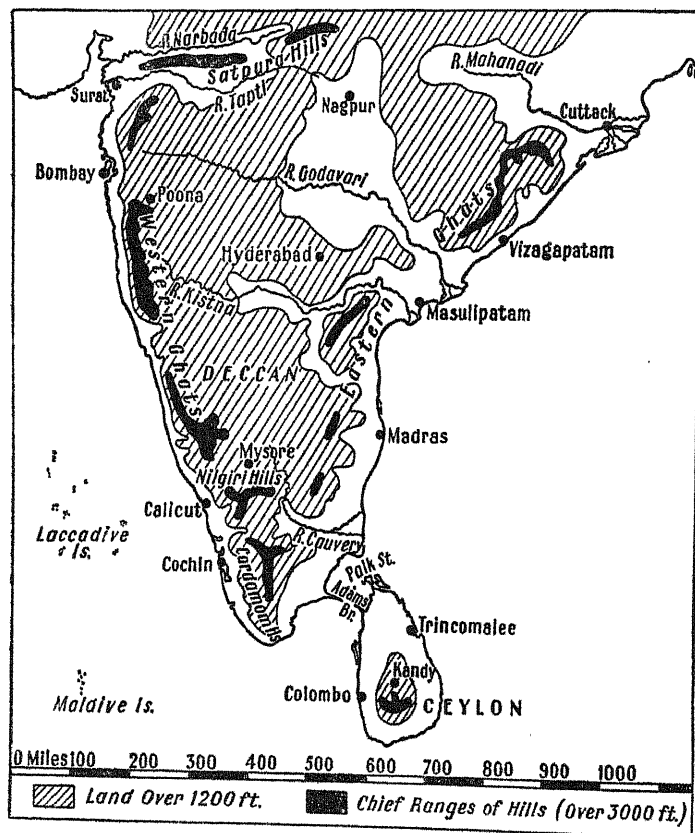


FIG. 140. SOUTHERN INDIA

The Deccan is a huge block of land tilted up on its western side and down towards the east. The high western edge has been worn by the weather into hills and valleys, and from the sea has the appearance of a range of mountains. These are known as the Western Ghats, while the lower eastern edge

is known as the Eastern Ghats. The rivers of the Deccan—the Mahanadi, Godavari, Kistna, and Cauvery—naturally follow the slope of the land and flow from west to east or from north-west to south-east. To the north of the Deccan are two rivers, the Narbada and the Tapti, which flow westward in deep narrow valleys.

Ceylon. This 'pendant pearl of India' is a separate Crown Colony, and is, therefore, not politically a part of India, though physically it is almost joined to the mainland by the line of rocks and sandbanks known as Adam's Bridge. The northern half of the island is a rather infertile plain built of limestone. In the southern half broad, fertile coastal plains rise gradually to a central mountain mass whose highest peak is Pedrotallagala (8,300 feet).

The population numbers about five million. Most of the people are Sinhalese, and are descended from invaders who came from northern India some two thousand years ago. The northern part of the island is inhabited chiefly by Tamils, whose ancestors came from southern India. There are also many Arabs, and some descendants of the original Portuguese and Dutch settlers.

As we have seen, the climate is of the double monsoon type, with heavy rain from both the north-east monsoon and the south-west monsoon. As Ceylon is very near the Equator the average temperature of each month is about 80° F.; and the high temperature and heavy rainfall make it very productive. The chief crops of economic importance are tea, rubber, coco-nuts and spices, and rice is the principal food crop.

LIFE AND WORK OF THE PEOPLE OF INDIA

The 350 million inhabitants of India to-day comprise many different types and races. Descendants of some of the

earlier inhabitants live in the less fertile parts of the Deccan. The Hindus, who are descended from Aryan tribes who invaded India more than three thousand years ago, now comprise two-thirds of the total population. They are divided into castes of which there are more than two thousand. In addition, there are 60,000,000 outcasts who are compelled to live under the most miserable conditions as they are allowed to do only such menial work as scavenging.

The Moslems invaded India between A.D. 1000 and A.D. 1500 and conquered a large part of the country. Their descendants are to be found chiefly in the north-western part of the country, but large numbers of people of the Hindu stock in the Ganges basin now follow the Mohammedan religion.

About 90 per cent of the people of India live in villages and depend directly or indirectly on the land for livelihood. Their houses are single-roomed huts of mud or bamboo without chimney or windows. Dried cow dung is used for fuel and floor-covering, and the only furniture consists of mats and vessels of earthenware or brass. The farms of India are small, and in the rice-growing area average less than three acres in extent. In the wheat-growing areas, however, the farms may be three or four times this size. Each village is surrounded by the farm land which is divided into small plots some of which are only a few yards square. It seldom happens that a man has all his plots adjoining each other. On the contrary, a farm frequently consists of ten or a dozen scattered plots. This, of course, entails a great waste of time and energy, but the farms are often so small that they may provide work for no more than half the year, and the Hindu peasant or ryot is, in consequence, desperately poor. The great majority of them are always in debt to the moneylender who charges exorbitant rates of interest—at least 25 per cent and sometimes as high as 300 per cent

per annum. As a consequence of these conditions there is a great deal of migration to the cities, especially during the dry season. In Calcutta, for example, only 25 per cent of the inhabitants are permanent residents. Conditions of life in the industrial cities are very bad. In Bombay, for example, two-thirds of the people have only one room per family, so it is not surprising that the health of the people is poor, that disease is rife, and the death-rate very high.

IRRIGATION

Hardly any country in the world depends so much on irrigation as India. Three different types of irrigation may be noted.

1. *Canals*. These are of two kinds: (a) the inundation or flood canals which serve a useful purpose in distributing the flood waters, but which are dry in winter, just when irrigation is most required. (b) Perennial canals which are fed from reservoirs constructed very high up the stream. As the name implies, these canals are kept full of water throughout the year. They enable the land to be irrigated and cultivation to be carried on all the year round, and as the temperature is always high enough for plant growth, land irrigated by such canals can produce at least two crops per year.

2. *Wells*. These are found chiefly in the Ganges basin where the soil below a certain depth is permanently saturated with water. The natives use various mechanical devices for raising the water.

3. *Tanks*. These are small reservoirs constructed by the natives on the Deccan. Each village has its own 'tank,' but it often happens that the rainfall is not sufficient to fill up the tank and in the ensuing season crop failure and partial famine result.

THE CULTIVATED CROPS OF INDIA

Rice occupies one-third of the cultivated area, and is grown on the lowlands which have more than 40 inches of rain. As rice produces a great deal of food per acre, and as two crops of rice and one other crop can often be produced on the same

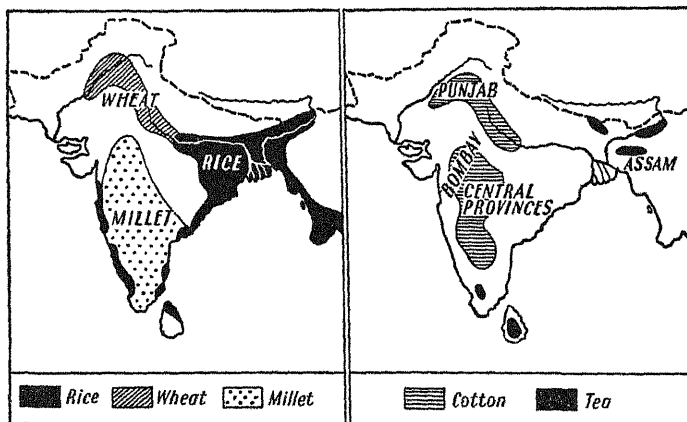


FIG. 141. INDIA—CHIEF PRODUCTS

plot of ground, the density of population in the rice-growing districts is very high.

Wheat is grown chiefly in the drier districts of the centre and the north-east. In the Punjab it is sown at the end of the summer rains and harvested at the beginning of the hot, dry season. Formerly much wheat was exported from Karachi, the port at the mouth of the Indus, but the Hindus now consume practically all the wheat grown within the country. Another area of great wheat production is the Central Provinces.

Millet is the chief food crop in those parts of India which are not wet enough for the cultivation of rice or fertile enough for the cultivation of wheat.

Oil seeds, such as ground-nuts and linseed, are widely cultivated on the Deccan, and on the eastern coastal plain.

Cotton is cultivated on irrigated land in the Punjab and on the so-called 'black cotton soil' of the Deccan. In the former region the cotton is of the 'long staple' American variety which finds a ready market in Britain and is exported from Karachi. In the latter area native Indian varieties of 'short staple' are grown. This is used by the Indian cotton mills or exported to Japan.

Tea. Forty per cent of the tea which enters into world commerce is produced in northern India, the chief regions being Assam and the Brahmaputra valley. Ceylon produces over 20 per cent of the world's supply and small quantities are also obtained from the hills at the southern end of the Deccan.

Jute. Practically all the world's supply of this fibre is obtained from the district immediately east of the Ganges Delta.

Rubber is obtained from plantations on the moist lowlands of Ceylon.

CITIES

Calcutta, situated some seventy miles up the Hugli, formerly the most navigable mouth of the Ganges, is the largest city and chief port of India. It taps all the wealth of the Indo-Gangetic plain, and as there are rich coal- and iron-fields about 100 miles to the north-west, it has become a great industrial city. It specializes in the manufacture of iron and steel goods and in sacking made from the home-grown jute.

Bombay, situated on a former island now joined to the mainland by a causeway, is the second port of India. It owes its

rise to the construction of railways across the Deccan, and to the opening of the Suez Canal, which gives it great advantages over its rival port of Calcutta.

Karachi, built on firm ground a few miles west of the delta of the Indus, is the great port for the Punjab. Its chief export is cotton.

Madras is the great port of south-eastern India. The east coast is entirely devoid of good natural harbours, but a large artificial harbour has been constructed at Madras; consequently at this port is concentrated nearly all the trade of the eastern Deccan. *Vizagapatam* is an ancient port which has been given a new lease of life by the construction of a good harbour and the building of a railway to the interior.

Delhi, the historic and present capital of India, is situated on the Jumna tributary of the Ganges and guards the great gateway between the Central Indian Plateau and the Himalayas. It is also at the head of boat navigation of the Jumna, and the focus of the routes of northern India.

Colombo, the capital and chief port of Ceylon, is at the centre of all the trade-routes of the Indian Ocean, and has consequently become a great calling and coaling station for ships. It exports the rubber, tea, and spices which are produced on the island, and has much transit trade on behalf of the surrounding regions.

CHAPTER XV

SOUTH-WESTERN ASIA—THE LANDS OF THE FIVE SEAS

THIS region is the corner of the Old World which lies between Europe, Africa, and India. It is bounded on the north by the Caspian Sea and the Black Sea, on the west by the Mediterranean, and on the south-west by the Red Sea. The Arabian Sea forms the southern boundary, but the Persian Gulf, which forms the centre line, is the fifth of the seas which give this region its alternative name—the 'Lands of the Five Seas.'

The region lies in roughly the same latitude as China, but whereas eastern Asia has summer monsoon winds from the sea, the summer winds of south-western Asia are hot and dry, since they blow outwards from the interior of Asia. Even in winter, when the north-western part of the area has westerly winds from the Mediterranean, the rainfall is low, since the winds have been robbed of most of their moisture before they reach the interior.

TURKEY

At one time Turkey was a great European power ruling most of the Balkan Peninsula, but one by one the present Balkan States—Greece, Bulgaria, and Yugoslavia—gained their independence, and after her defeat in the Great War of 1914-18 Turkey, though retaining a small triangular area of territory around Constantinople, ceased to be a European power. In recent years, however, Mustapha Kemel, the late ruler of Turkey, carried out many reforms directed towards the increasing westernization of his country.

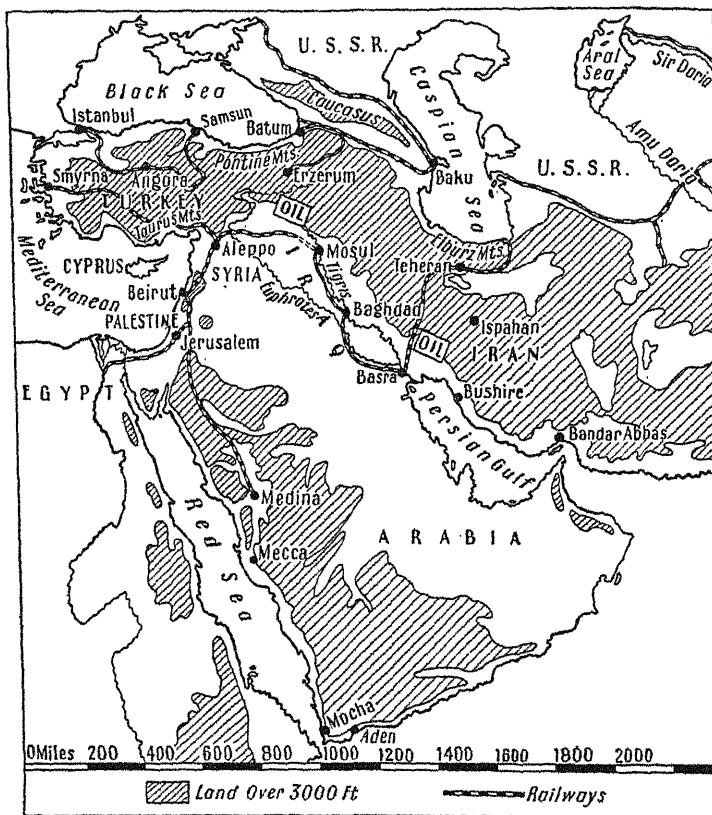


FIG. 142. LANDS OF THE FIVE SEAS

From the geographical point of view Turkey may be considered as consisting of two natural regions—the Mediterranean coast-lands and the interior plateau. In the coastal region the winter rains are sufficient to allow agriculture to be carried on, the chief food crops being wheat, barley, rice, olives, and

grapes. The district around *Smyrna* is the most productive part of Turkey, and is specially noted for the cultivation of figs and cotton. On the plateau most of the people are nomads, who tend herds of cattle and flocks of sheep and goats. Agriculture is confined to a few areas which are exposed to the rain-bearing winds.

Angora (Ankara), the capital of Turkey, is situated on an old volcanic plug in the middle of a desert. It is linked with the Mediterranean and the Black Sea by railway, and is, therefore, a convenient centre for the government of the country. *Trebizond* is the chief Black Sea port and *Adana* and *Mersina* are ports on the southern side of the peninsula.

IRAQ

Iraq is the name now given to Mesopotamia, the low-land drained by the rivers Tigris and Euphrates. Before the Great War it was ruled by Turkey; after the War, Britain was granted a mandate over the country by the League of Nations, but in 1926 it became an independent country. The alluvial plain which forms the heart of the country is built entirely of deposits laid down by the rivers Tigris and Euphrates and even now the delta is growing at the rate of two miles per century.

Agriculture in Mesopotamia is almost entirely dependent on water drawn from the two rivers. In ancient times a strong centralized government ensured the conservation and distribution of water, but after the Turkish conquest the irrigation system was neglected. In modern times, however, some of the old irrigation channels have been restored and new ones built, thus greatly increasing the productivity of the country. In winter there are some cyclonic rains, and the rivers flood in March. There are two harvests, wheat, barley, and beans

being reaped in spring, whilst rice and maize are harvested in late summer. Dates, which attain perfection only in Upper Egypt and Iraq, are the chief money crop. Iraq provides about 80 per cent of the dates which enter into the world's trade.

Baghdad, which was for many centuries the chief city of the Mohammedans, is the capital of Iraq. It is the meeting point of caravan routes from Syria to Arabia and Persia, and is linked by railway to the Persian Gulf. The so-called Baghdad railway, which was planned to link Baghdad to Constantinople, is expected to be completed in 1939.

Basra is the second city and chief port of Iraq. It is situated at the limit of ocean navigation of the combined rivers Tigris and Euphrates, and is sometimes known as the City of Dates since this crop represents by far the chief export.

Mosul is the chief city of the north, and *Hilla* is a modern city situated near the ruined city of ancient Babylon.

PALESTINE

This region is administered by Britain under a mandate from the League of Nations. The dominant physical features are two ranges of mountains with the rift valley of the Dead Sea and the Jordan valley between (see Fig. 143).

The *coastal plain*, which is some twenty miles wide, is climatically the most favoured, and has also the advantage of fertile soil. Here are large areas which have been cultivated by immigrant Jews from various countries. The chief productions of the region are 'Jaffa' oranges and grapefruit. The *mountain ranges* are composed chiefly of limestone; they are, therefore, rather infertile, and are given up chiefly to the rearing of sheep and goats, and the cultivation of olives. The *rift valley* is, in part, below sea-level, and is, therefore,

one of the hottest regions of the world in summer. Most of it is desolate and unpeopled, but large areas could be irrigated from the Jordan.

During the War Britain made two promises about Palestine: On the one hand, to provide a national home for the Jews, and on the other to respect the rights of the native Arab inhabitants. Since the War there has been a great influx of Jews, and much friction between them and the Arabs. In May 1939 the British Government announced its intention to establish within ten years an independent Palestine State which will be governed jointly by Arabs and Jews. In the meantime Britain will remain

responsible for the government of Palestine, but Arabs and Jews will be given an increasing part in the government.

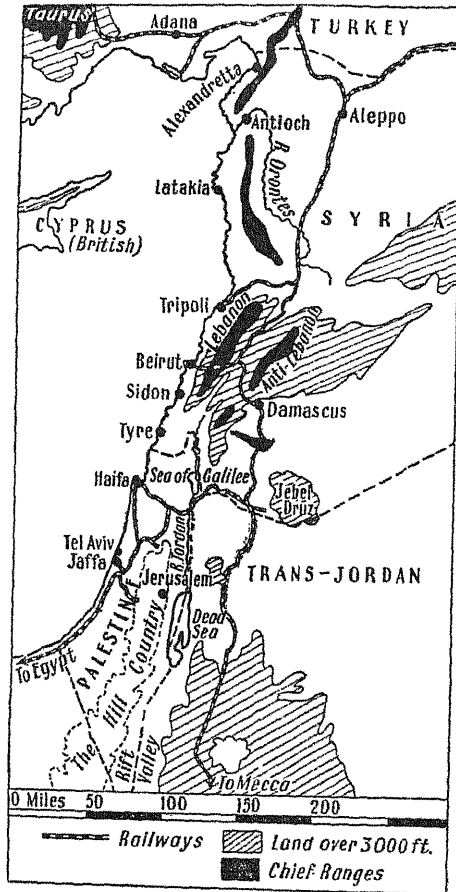


FIG. 143. PALESTINE AND SYRIA

Jerusalem, the capital of Palestine, is a Holy City not only for Christians but also for the Jews and Arabs.

Haifa is the natural outlet for the whole of the country, and has recently had its harbour reconstructed to enable it to cope with greatly increased traffic. It is also one of the termini of the oil pipe-line from Iraq.

Tel Aviv is a new Jewish city on the outskirts of Haifa. It is the centre of a rich orange-growing district.

SYRIA

This region lies to the north of Palestine, and is under a French mandate. Physically and climatically it is similar to Palestine, though the rift valley is not so well marked.

Beirut is the chief port and one of the two termini of the oil pipe-line from Iraq (see above).

Damascus is an ancient city situated in a plain which is irrigated by the waters of the river Barada (the Abana of the Bible).

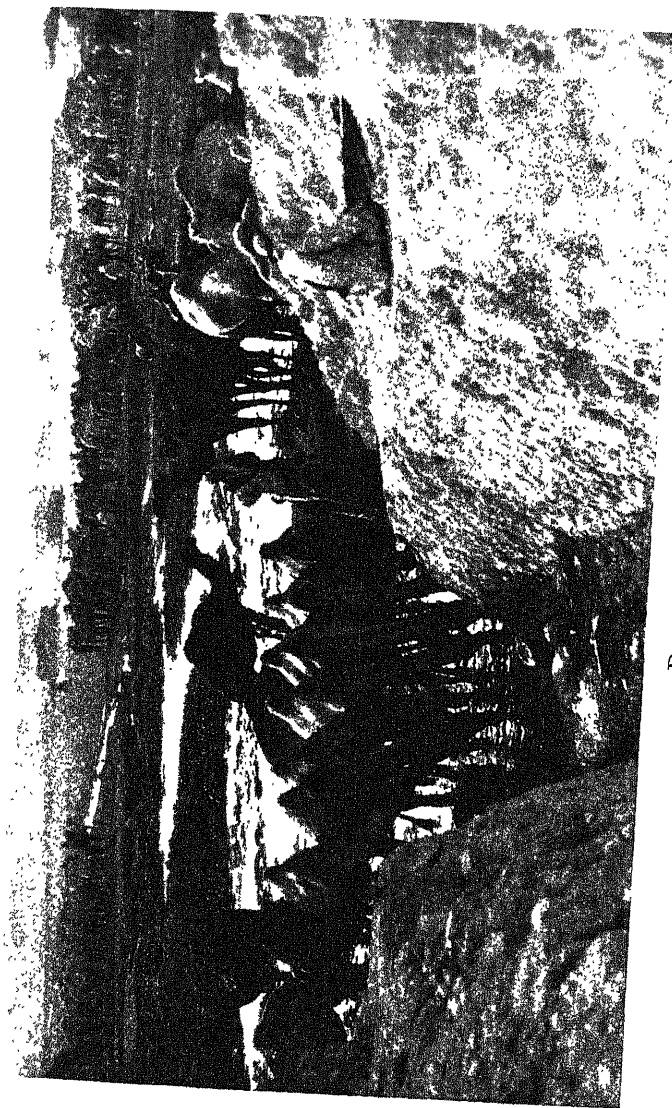
ARABIA

This country is a huge tilted block with a high steep edge overlooking the Red Sea and a gentle slope towards Mesopotamia. Large areas of the interior are absolute desert without a drop of water or a blade of grass, but around the edges of the plateau are regions which provide pasture for flocks and herds tended by tribes of Bedouin Arabs.

YEMEN in the southern corner receives much moisture from the heavy mists, and is notable for the production of Mocha coffee.

Mecca, where Mohammed was born, is the chief Holy City of the Arabs.

Aden is a British fortified station, and a coaling port on the route to India.



DESERT RAIN-POOLS

Mondite

IRAN (PERSIA)

Iran, as Persia is now called, consists of a great plateau situated at a height of 3,000 feet to 5,000 feet and bounded by still higher mountain ranges. It suffers greatly from lack of rain, but melting snows provide water for the irrigation of small areas in the valleys. The country is predominantly agricultural, the chief crops being wheat, barley, millet, and rice. Sheep are reared on the dry mountain-sides, and yield the wool which is used for the manufacture of the famous Persian carpets. The most important export of Persia is petroleum which is conducted by pipe-lines to ports on the Persian Gulf.

Teheran is the capital and the centre of the caravan routes. A great trunk-line railway has recently been constructed from the Caspian Sea to the Persian Gulf (see Fig. 142).

AFGHANISTAN

This mountainous kingdom is of importance to Britain because of its situation athwart the land routes leading to India. Agriculture is possible only in specially favoured valleys which are irrigated by streams fed by the melting snows.

Kabul, which controls the western end of the route to Iraq by the Khyber Pass, is the capital of the country.

CHAPTER XVI

RUSSIA (ASIATIC AND EUROPEAN)

RUSSIA, or the Union of Socialist Soviet Republics (U.S.S.R.), comprises one-sixth of the earth's surface, and contains one-twelfth of the world's people. Up to 1917, it was a vast empire ruled over by the autocratic Tsar and his advisers. In that year, however, a revolution took place, and the Communists, led by Lenin and Trotsky, gained control of the country. The Soviets were originally elected to deal with local affairs. Many of these Soviets joined together to form republics and various republics combined to form the Union of Socialist Soviet Republics.

The physical map shows that, apart from the Caucasus and the Urals and parts of eastern Siberia, the country is one vast plain stretching for a third of the way round the world, and, in its widest part, 2,500 miles from north to south. Though there is little physical variety in Russia there are great climatic variations, and these cause great differences in the types of vegetation and the modes of life of the people.

The Tundra regions. The extreme north is ice-bound for nine months in the year, and has hitherto only supported a scanty population of tribes akin to the Lapps and Eskimos who subsist on fishing, hunting, and reindeer herding. In recent years, however, the Russians have been successful in establishing commercial and educational settlements in this region. Great progress has also been made towards maintaining a summer steamer service along the Arctic coast. In 1936 one hundred and sixty vessels navigated the northern sea, of which fourteen made through voyages. It is hoped

that the Siberian rivers the Ob, the Yenesei, and the Lena will eventually become great commercial highways, linked to each other and the outer world by air and by sea.

The *coniferous forest*, or *taiga*, occupies the whole of eastern Siberia from the tundra to the mountains of central Asia, but the belt narrows towards the west, and in Europe its southern limit is marked roughly by the Gulf of Finland. The chief product of the coniferous belt is timber of which

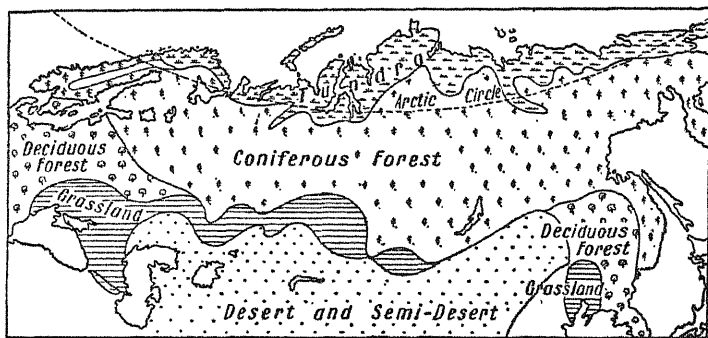


FIG. 144. RUSSIA—VEGETATION

Russia supplies about 20 per cent of the world's output. Considerable quantities of valuable furs are also produced.

Deciduous forest, consisting of such trees as oak, beech, ash, etc., occupies the triangular area south of the coniferous belt of European Russia. This region has a more fertile soil and longer, warmer summers than the taiga region; consequently, a large proportion of it has been cleared for agricultural settlements, the chief products being rye, flax, oats, and potatoes.

The *temperate grasslands and steppes* lie south of the deciduous forest area of Europe and south of the coniferous forest area of eastern and central Siberia. In this area the rainfall

is rather scanty, but most of it falls in the summer half of the year and this, together with the additional moisture supplied by the melting snow in spring, is generally sufficient for the growth of good grass and even for the cultivation of crops. The fertile belt of Black Earth which extends across the middle of the steppe land is especially suitable for the cultivation of wheat and cotton. Some of the largest towns of Russia have grown up at the junction of the grassland area with the belt of deciduous forest, since it was there that the wheat, maize, and other agricultural products of the grassland could be readily exchanged for the forest products. *Kiev*, at the present head of navigation of the Dnieper, is one of the oldest cities in Russia and was at one time capital of the Muscovite Empire. It is now a busy industrial area specializing in the manufacture of machinery, flour, and sugar. Other cities on this line are Orel, Kazan, and Perm.

Semi-desert and desert occupy the region north of the Caspian Sea and the lowland draining to the Sea of Aral. On the flanks of the mountains to the south-east there are several areas of intensive cultivation which are supplied with water from the mountain streams, and the Soviet Government have ambitious plans for irrigating portions of the land around the Sea of Aral. With the exception of such irrigated areas, however, the land will never be able to support more than the scanty population of herdsmen.

AGRICULTURE

Before, and for some years after, the Bolshevik Revolution, Russia was a land of peasant farmers. The farms were generally very small, the farming methods were primitive and inefficient, and the output per man was very small. The Soviet Government has reorganized the agriculture of the

country on Communist lines and two types of communistic farms have been established:

(a) *State farms or sovkhoz* which were set up chiefly in semi-arid areas which had never previously been farmed, or on the former private estates of noblemen. The largest of these state farms, known as the Giant, is the size of Oxfordshire, but the majority of the state farms are only a few square miles in extent.

The farms are run like factories, and modern agricultural machinery drawn by motor tractors is used for ploughing, sowing, harvesting, reaping, etc. As many of the state farms are in areas which have a short growing season, every effort is made to get the crops sown immediately after the melting of the snow, and often the huge fields are floodlit to allow ploughing to be continued throughout the night. When sowing is completed many of the workers are drafted to other state farms or factories in the towns. The chief crop grown on state farms is wheat, but there are also state farms devoted to the production of flax, cotton, etc.

(b) *Collective farms or kolkhoz*. To form a collective farm the peasants in a particular district pool their land, stock, and implements, thus obtaining one huge farm on which they work together under the direction of a manager. Modern agricultural machinery is used, expert advice is given by government officials and additional labour is sent by the Government if urgently needed. Each worker receives a share of the crop varying with the amount and quality of the work done. In addition to his share of the produce of the collective, each member has the right to own a small plot of land not more than an acre in extent, together with a cow, a few pigs or sheep or goats. Though at first there was much opposition to the establishing of collectives, the system is now firmly established and 98 per cent of the cultivated land is in either collective or state farms.

Wheat is grown principally on the former grasslands (the 'steppes'), the most productive regions being those in which the fertile Black Earth occurs. In recent years, however, there has been an extension of wheat-growing northward

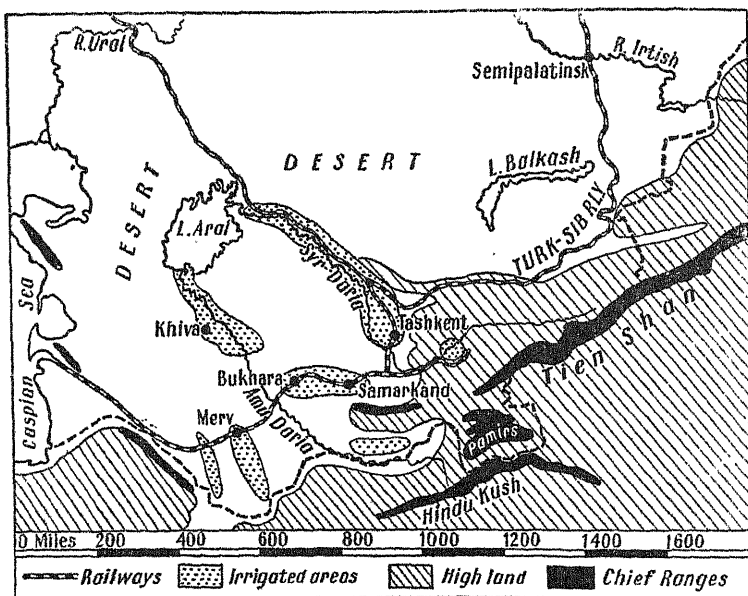
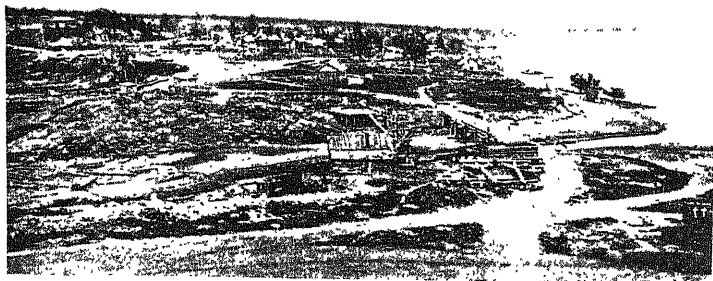


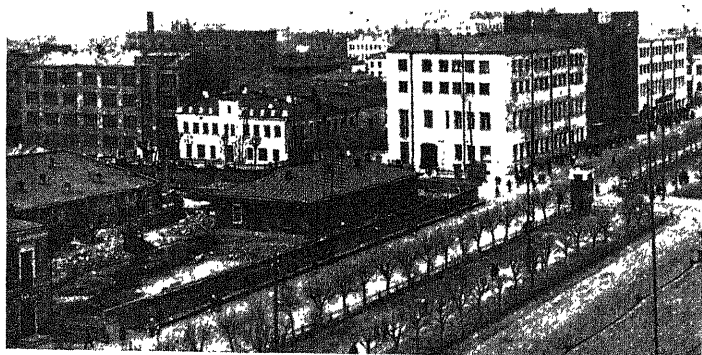
FIG. 145. THE ARAL BASIN OF CENTRAL ASIA

into the former forest lands and eastwards into Siberia. The vernalization method of treating seed mentioned on p. 79, has even made possible the cultivation of wheat in the tundra region.

Rye, from which the so-called black bread is made, is the chief food crop of the northern half of Russia. *Flax* is the chief money crop in the clearings of the deciduous forest area,



NOVO-SIBIRSK BEFORE THE COMMUNIST REVOLUTION



NOVO-SIBIRSK TO-DAY

E.N.A.

and in this region nearly 80 per cent of the world's output of flax is produced. Though the production of flax is almost double that of pre-War years, exports have declined, since increasing quantities are needed for the Russian linen industry.

Sugar beet is widely cultivated in both the deciduous forest and former grassland areas. As in other beet-growing regions the waste pulp from the sugar factories is returned to the farmers for use as cattle food. *Cotton* is widely grown on irrigated areas in Turkestan, the chief centres of production being the ancient cities of Tashkent and Bukhara. In recent years there has been a great increase of cotton production on the grassland region north of the Black Sea. Russia now produces 10 per cent of the world's cotton and is able to supply all the demands of her cotton factories.

MINING

Coal. The output of coal is now nearly five times that of pre-War years, and new mining areas have been developed in both European and Asiatic Russia. The chief coal-fields are:

1. *The Donetz valley*, some 300 miles north of the Black Sea. In pre-Soviet times this field produced over 90 per cent of Russia's coal, but at the present time though the production from this field is three times as great as in 1913, its output represents only two-thirds of the country's total.

2. *The Moscow field*, which, though producing only poor coal and lignite, now supplies about one-sixth of the capital's needs of fuel.

3. *The Ural area* where large quantities of lignite are obtained.

4. *The Kuznetsk district* in the upper valley of the Ob, where there is one of the largest reserves of coal in the world.

It was almost unworked before 1925, but is now the second coal-field of Russia.

5. *The Irkutsk district* near the southern shores of Lake Baikal.

6. *The Far Eastern coal-field* which has been developed to supply the growing industries of that region.

Petroleum. Next to the United States, Soviet Russia is



FIG. 146. U.S.S.R.—MINING AREAS AND RAILWAYS

the world's largest producer of petroleum. The chief oil-fields are situated on the margin of the Caucasus Mountains and near the shores of the Caspian Sea (see Fig. 147).

Baku is the most famous oil town. Before the Communist Revolution it was almost the only oil-producing district in Russia, and nearly all the oil was sent by pipe-line to Batum on the Black Sea, whence it was exported. Nowadays, however, all the districts shown on the map are great oil-producers and most of the oil is refined before being exported or sent to other parts of Russia. The recent great increase in the use of motor transport has lead to such great demands for petrol

that every endeavour is being made to develop new oil-fields such as those of the White River, the Petchora River, and the Far East.

Iron. Soviet Russia is now second largest producer of iron in the world. The chief mining and smelting districts are:

1. *The Donetz valley, near Kharkov.*
2. *The Dnieper basin.*
3. *Around Kerch in the Crimean Peninsula.*

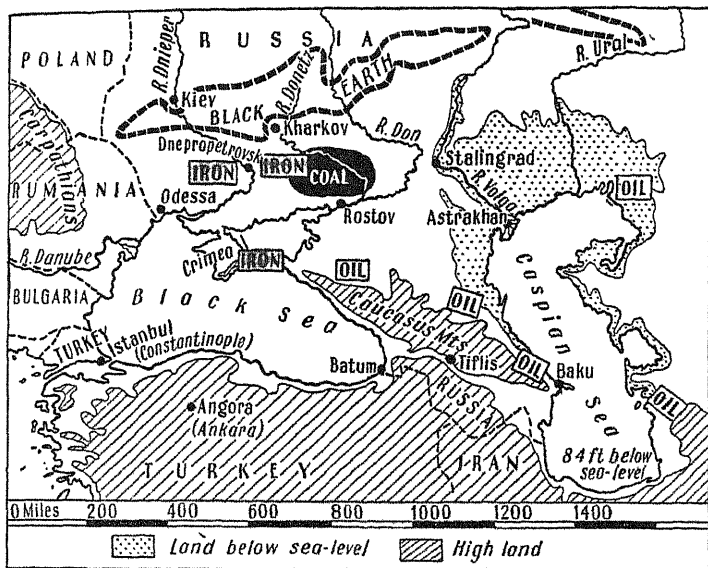


FIG. 147. SOUTHERN RUSSIA

The chief city of the Donetz region is *Kharkov* which is engaged principally in the heavy steel industry, and in the manufacture of armaments.

4. *Magnitogorsk (Magnet Mountain)* at the foot of the Ural Mountains. Here is one of the world's largest iron ore deposits,

and one of the largest centres of the iron and steel industry of Russia. The ore is smelted with coke drawn from the Kuznetsk district to which pig-iron is sent as return freight.

5. In the *Far East* iron mining and smelting have been developed in order to save the cost of transporting supplies from Europe.

Non-ferrous metals (that is, metals other than iron).

Copper is mined in the Urals on the northern shore of Lake Balkash and near Tashkent in central Asia. The production of copper in the U.S.S.R. increased tenfold between 1926 and 1937, and the country now accounts for about 5 per cent of the world's output.

Platinum, of which Russia produces a quarter of the world's supplies, is mined in the Urals.

Lead, zinc, and aluminium are also produced in considerable quantities, the chief mining area being the Urals.

Gold. Russia has made enormous strides in gold production in recent years and now produces about one-sixth of the world's total, her output being exceeded only by that of the Union of South Africa. Most of the gold-fields are in central and eastern Asia, the most famous being the Lena gold-field on the river of that name.

MANUFACTURING

One of the outstanding achievements of the Soviet Five-Year Plans has been the great increase in industrial development, and the Russians claim that in a few decades they will be the foremost manufacturing people in the world. In European Russia the chief manufacturing areas are:

1. *Moscow*, which specializes in the making of cotton goods, electrical equipment, cannon balls, ball-bearings, and railway rolling stock.

2. *Leningrad* which is the centre for ship-building and the manufacture of hydro-electricity generators.

3. *Gorky* (formerly Nijni-Novgorod), where, it is claimed, is the largest motor-car factory in Europe.

4. *The Ukraine Republic* of southern Russia, which is concerned mainly with the heavy metal industry. Kharkov, in the upper Donetz basin, has already been mentioned.

5. Other manufacturing centres in European Russia are Stalingrad, Saratov, and Rostov which specialize in the production of tractors and agricultural machinery.

6. In Asiatic Russia the chief manufacturing centres are the new cities of Magnitogorsk, Kuznetsk, and Novo-Sibirsk (the so-called 'Chicago of Siberia'), and such older towns as Omsk, Tomsk, and Semipalatinsk.

RIVERS AND CANALS

The rivers of the plain of European Russia rise on the low watershed which runs eastward from the Valdai Hills, the highest point of which is only 1,150 feet above sea-level. As the average slope from this watershed to the Black Sea, the Caspian Sea, and the Arctic Ocean, is less than one foot in one mile, the Russian rivers are very slow flowing, and though they suffer from many drawbacks such as freezing in winter, flooding in spring and, in the case of those flowing south, drought in summer, they have always been of very great importance for transport. The Asiatic rivers—the Ob, the Yenesei, and the Lena—are open for navigation for only four or five months in the year, and have the further disadvantage of flowing to the Arctic Ocean. Nevertheless, the recent development of the Arctic Sea route referred to on p. 296 has been accompanied by a great increase in the use of these rivers for the transport of timber, furs, etc., to the

coast. The new port of *Igarka* on the Yenesei River is the chief outlet for this region. 'Some seven years ago Igarka consisted of a few broken-down shacks beside which a few reindeer grazed, now it has a population of some 20,000 people, and forms part of a chain of ports, trading centres, and polar stations linked by a hundred wireless stations, and a fleet of 125 aeroplanes.'¹

In European Russia the system of inland waterways has been greatly improved by the construction of canals, of which one of the most notable is the White Sea Ship Canal which runs from Leningrad via Lakes Ladoga and Onega to the White Sea.

Another great Russian achievement was the construction of the Moscow canals which not only provide a deep waterway from the city to the Volga and thence to the Gulf of Finland and the Caspian Sea, but also ensure an adequate supply of water to the city, together with abundant supplies of hydro-electricity, which is generated at the weirs on the canals.

On the river Dnieper a great dam has been constructed at Dneprostroy some 200 miles from the sea. This has made the upper course of the river navigable as far as Kiev, and enormous supplies of hydro-electricity are generated at the locks for distribution in the factories throughout the Ukraine. Other schemes of river control which are at present in hand are: the linking together of the Volga and the Don at Stalin-grad where they come close together; the diversion of flood waters from the Arctic rivers into the Volga; the utilization of the Volga for the irrigation of the dry areas around the Caspian; and the irrigation of the desert areas around the Sea of Aral.

¹ *Manchester Guardian Commercial*, 22nd Jan. 1937.

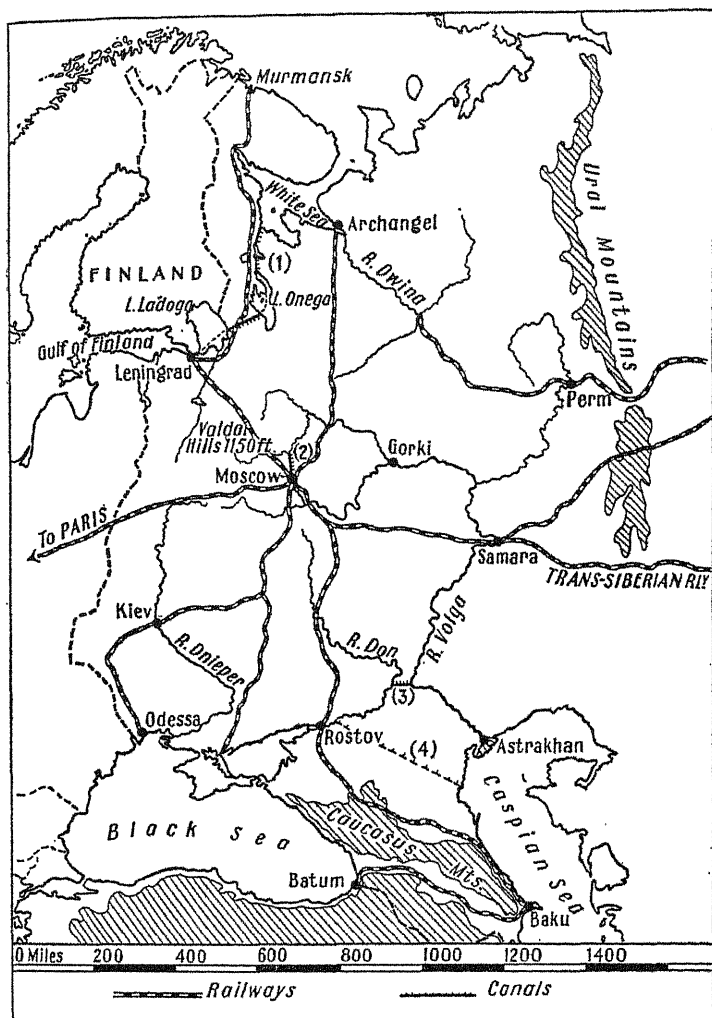


FIG. 148. EUROPEAN RUSSIA

- | | | |
|--------------------------|---------------------|---------------|
| (1) White Sea Ship Canal | (3) Volga-Don Canal | } to be built |
| (2) Moscow Canals | (4) Manych Canal | |

RUSSIAN RAILWAYS AND CITIES

Russia is such a vast country that although she has more than fifty thousand miles of railways—that is more than any other country save the United States—she has only one mile of railway for every one hundred and sixty square miles of territory, whereas Britain has one mile for every five square miles, and Belgium one mile for every two square miles. During the last twenty years, however, great strides have been made in railway development and the present length of railway is 50 per cent greater than that of pre-War days.

As shown in Fig. 148 the railways of European Russia radiate from Moscow (these lines should be traced on the atlas map from which a sketch map should be drawn).

Leningrad—formerly known as St Petersburg after Peter the Great, who founded the city as a ‘window to Europe’—is Russia’s chief port as well as one of its chief industrial centres.

Archangel is Russia’s chief port on the Arctic Ocean, but suffers from freezing of its harbour for an average period of 180 days in the year.

Murmansk, though 300 miles farther north than Archangel, is free from ice all the year round since it enjoys the warming influence of the west winds and an extension of the Gulf Stream.

Odessa is Russia’s chief port on the Black Sea, a position which it owes in large measure to the fact that its harbour is practically ice free, whereas those farther east are ice-bound for several weeks.

Astrakhan at the mouth of the Volga is the principal port on the Caspian Sea. It is particularly noteworthy for the distribution of petroleum, fish, and salt.

Vladivostok is the terminus of the Trans-Siberian Railway and the great Russian port and naval station of the Far East.

The Trans-Siberian Railway which was completed in 1902, runs from Moscow to Vladivostok, a distance of 4,500 miles. The railway crosses the Urals some 130 miles from Magnitogorsk and traverses the zone of wooded steppe land which divides the forest of the north from the grasslands of the south. *Omsk*, on the Irtysh, and *Novo-Sibirsk* are the chief towns served by this section of the line.

Irkutsk. Forty miles beyond Irkutsk the line turns south to round the southern end of Lake Baikal, the deepest lake in the world. From Chita, which is reached on the seventh day from Moscow, the former Trans-Siberian Railway line turns south-eastward into Manchuria (Manchukuo) and so to Vladivostok. In 1931 the Japanese took Manchuria from the Chinese and Russia eventually sold this section of the railway to Japan for £8,000,000. Since then the old single line on the northern side of the Manchukuo border has been double-tracked, and now serves as the main line to Vladivostok.

CHAPTER XVII

EUROPE

GENERAL OUTLINE

Structure and relief. Fig. 149 shows the chief elements in the structure and relief of Europe.

In the north-west are the Scandinavian and Scottish highlands, which are remnants of one of the oldest mountain ranges in the world. Sweden and Finland occupy a worn-down land-mass called the Baltic shield, which has been land from the earliest geological times. South of the Baltic and the North Sea is the great plain of Europe, shaped like a triangle with its base on the Urals and its apex in the English midlands. Central and Southern Europe is a complex region of plateaus, mountain chains, valleys and plains, peninsulas, and semi-inland seas. The key to the whole area is the system of fold mountains which may be represented diagrammatically thus: — S I 2 —. The first horizontal stroke represents the Cantabrians and the Pyrenees; the S comprises the Alps, the Apennines, Sicily, the Atlas Mountains, the Sierra Nevada, and the Balearic Islands. The vertical stroke is the Illyrian Alps, the 2 is formed by the Carpathians and the Balkans, and the final stroke represents the Crimean Peninsula and the Caucasus.

In the angles between these ranges are certain plateaus of hard, old rock, such as the Meseta of Spain, the Central Plateau of France, and the Bohemian block. Within the loops of the fold mountains are certain fertile plains which were formed by the subsidence of the land, e.g. the basin of

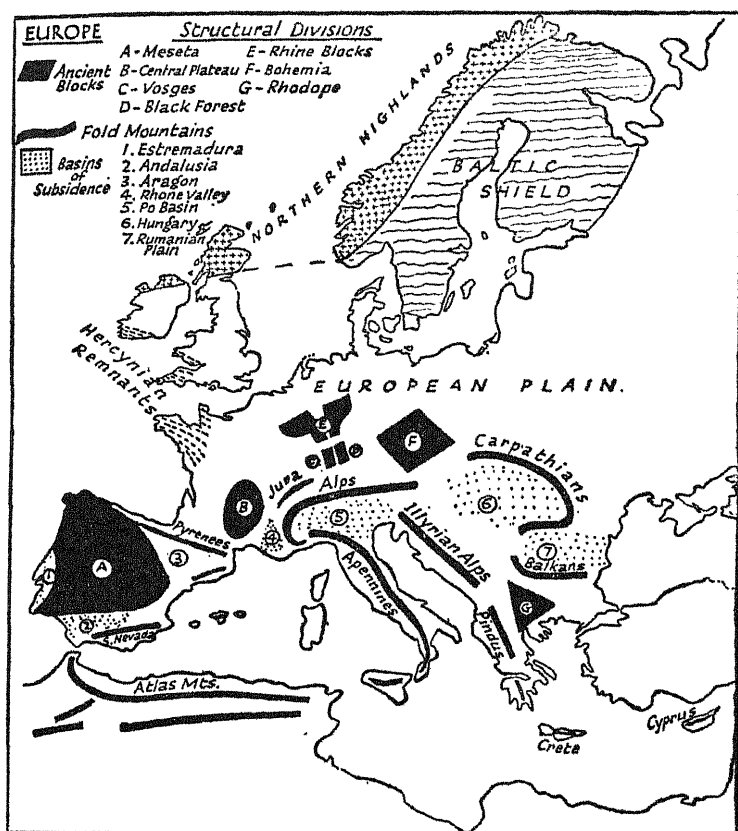


FIG. 149. EUROPE—STRUCTURAL DIVISIONS

the Po and the plain of Hungary; and in south-western Britain and north-western France are remnants of an ancient mountain range which, hundreds of millions of years ago, probably stretched far out into the Atlantic.

The rivers have been of great importance in the historical

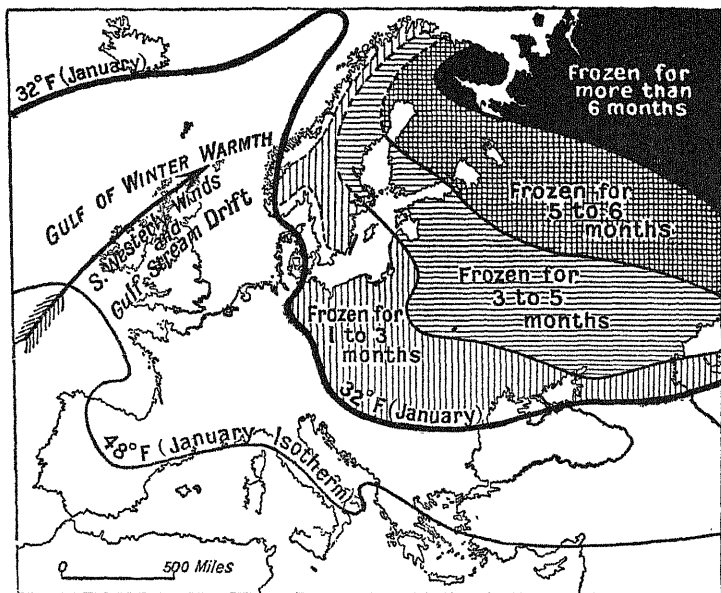


FIG. 150. EUROPE—WINTER TEMPERATURES

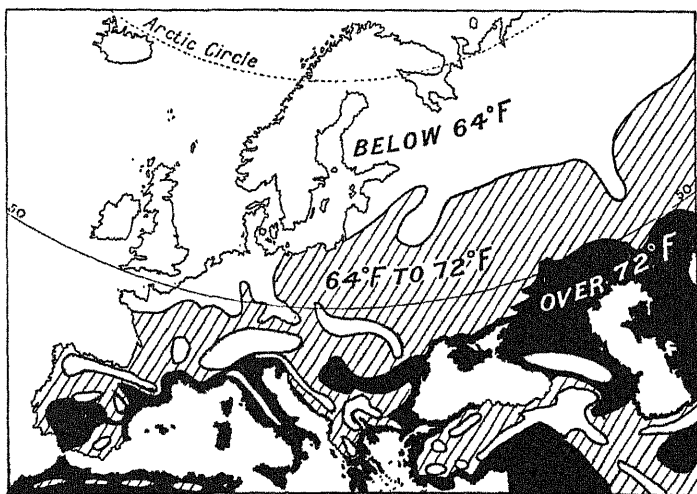


FIG. 151. EUROPE—SUMMER TEMPERATURES

and economic development of the continent. It will be noted that the largest rivers are arranged in pairs, each pair forming a diagonal route across the continent, e.g. the Rhône-Saône and the Seine; the Rhine and the Danube; the Vistula and the Dniester, the Northern Dvina and the Volga.

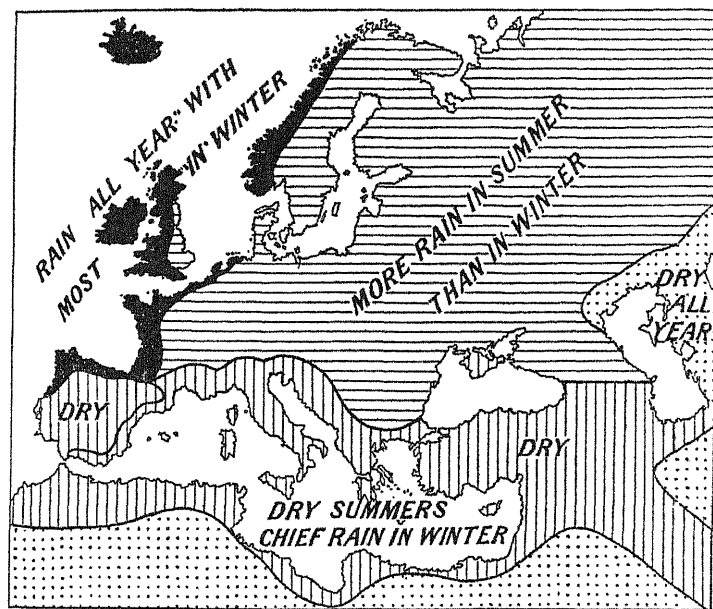


FIG. 152. EUROPE—SEASONAL RAINFALL

Climate. The general features of the climate of Europe have already been dealt with in the section on world climates. Figs. 150 to 153, however, emphasize the following points:

1. Winter temperatures decrease towards the east and north-east, as the ameliorating effects of the mild south-westerly winds diminish with distance from the Atlantic.

2. Summer temperatures increase towards the Equator and towards the heated interior of the Euro-Asian land-mass.

3. North-western Europe has rain at all seasons, the Mediterranean region has its chief rain in winter, and the

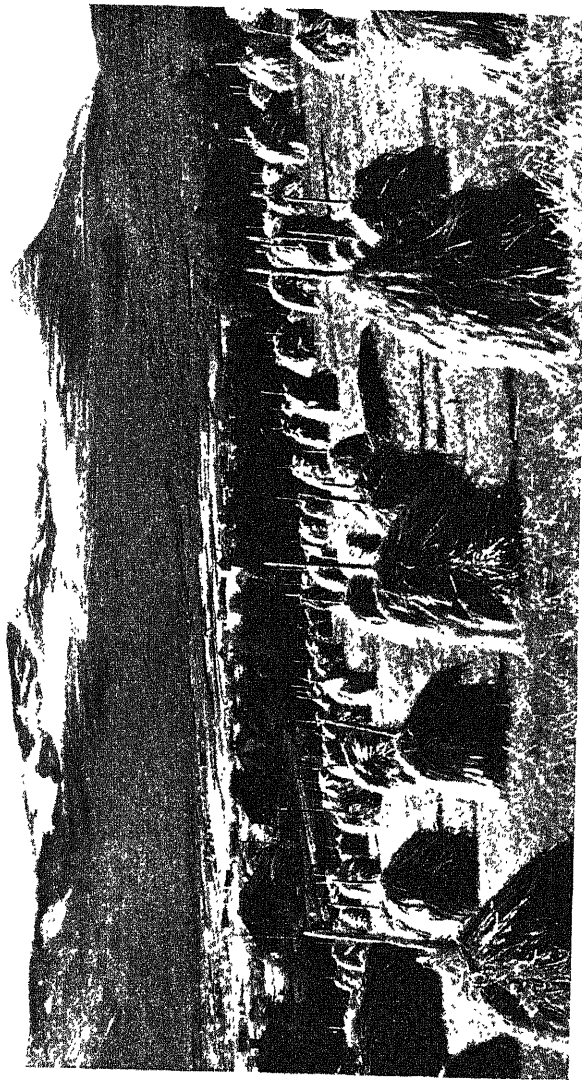


FIG. 153. EUROPE—CLIMATIC DIVISIONS

continental interior has more rain in summer than in winter. South-eastern Russia has inadequate rainfall throughout the year.

SCANDINAVIA

The dominant feature of the Scandinavian Peninsula, which comprises the two countries of Norway and Sweden, is a dissected highland known as the Kiolen (keel); indeed, from



HAY HARVEST NEAR THE DOVRE RAILWAY, OPDAL, NORWAY
Norwegian State Railways

the physical point of view the peninsula may be compared to an upturned boat, tilted so that the Norwegian part is practically immersed in the Atlantic. This physical formation accounts for many of the differences between Norway and Sweden:

1. In Norway the highland comes near to the coast and slopes steeply down to the sea, thus restricting cultivation to small patches of fertile land. Sweden, on the other hand, has a broad plain between the mountains and the sea, and has a much larger area of forests and cultivated land.

2. In Norway the steep edge of the highland is dissected by numerous fiords, while the coast-line of Sweden is relatively straight.

3. The highland causes the moist westerly wind from the Atlantic to rise suddenly on approaching the land, thus depositing abundant rain on the Norwegian side; Sweden, however, is situated in the rain-shadow and so has a much lower rainfall than its sister country.

4. Norway has very mild winters for its latitude, since it receives the full benefit of the oceanic influences; Sweden, however, is shut off from these oceanic influences, but is open to winds from the continent, and has, therefore, a much more extreme climate than Norway. The fiords of the Norwegian coast are rarely frozen, whereas the Gulf of Bothnia freezes over every winter, and the Baltic Sea freezes at the edges.

5. Fishing is more important in Norway than in Sweden, partly because of the greater abundance of fish in the Atlantic, and partly because of the lack of fertile farming land.

6. Nearly all the people of Norway live near the coast, whereas the population of Sweden is much more evenly distributed.

Denmark, the third Scandinavian country, consists of the

peninsula of Jutland together with certain islands (Fünen, Zealand, Laaland, Falster, and Bornholm). Physically, Denmark is very different from Norway and Sweden, as it is all lowland. The people, however, are of the same stock as those of the Scandinavian Peninsula, speak a similar language, have a similar form of government (a limited monarchy), and have a great community of interests, both national and international.

The occupations of the people in the three countries are determined largely by the geographical features.

Lumbering. Both Norway and Sweden are important producers of timber, though the area of forest in Norway is considerably restricted by the extent of the highlands and the steepness of the mountain slopes. In Sweden, on the other hand, forests occupy half of the total area, and the country produces 16 per cent of the world's exports of soft woods.

Fishing is one of the chief industries of Norway, but is of only secondary importance in Sweden and Denmark. Cod-fish are caught principally in the North Sea and Arctic Ocean, the chief centres being the Lofoten Islands, and Tromsö and Hammerfest in the extreme north. Most of the fish are dried and salted for export. Herrings and sardines are caught chiefly in the seas off southern Norway, the chief fishing ports being Trondhjem, Bergen, and Stavanger.

Norway is also the chief whaling country in the world, but the whales in the Arctic Ocean have been almost exterminated, and the chief field of operation is now the Antarctic Ocean.

Mining is of primary importance only in Sweden, and even here the only mineral produced in great quantities is iron ore. The Dannemora district of central Sweden produces very high-grade iron ore, most of which is used within the country. Kiruna and Gellivare in the north of Sweden produce large quantities of iron ore, nearly all of which is exported from

the Baltic port of Lulea in the summer and from the Norwegian port of Narvik in winter, when the Gulf of Bothnia is closed by ice.

Farming. In Norway only 4 per cent of the land is cultivated, yet the bulk of the people depend upon farming for their livelihood. Wheat will not ripen, and rye, hay, and roots are the chief crops.

Sweden, with a much larger area of very fertile lowland, has 12 per cent cultivated. The chief farming region is in the province of Scania in the extreme south. Here the chief specializations are in wheat and dairying.

Denmark is primarily a dairying country. The farms are small, there is little permanent grassland, and most of the cattle-food is produced on arable land. The farmers are grouped in co-operative societies which undertake the manufacture and marketing of butter, bacon, etc. Denmark is the world's leading exporter of butter, bacon, and eggs, her chief customer being Britain.

Mining and Manufacturing. From a manufacturing point of view all the Scandinavian countries suffer from lack of coal and other minerals. Norway and Sweden have, however, a great advantage in their abundant supplies of hydro-electricity. In Norway the chief manufacturing area is around Oslo, the capital, where there are factories devoted to the manufacture of textiles, paper pulp, and small metal articles. In Sweden much of the timber is used for the manufacture of wood-pulp, paper, artificial silk, matches, doors, window frames, and cheap furniture. In central Sweden the excellent iron ore of Dannemora is used in the manufacture of such articles as cutting tools and ball-bearings. Many Swedish industries owe their origin to the country's inventors. The match industry, for example, was based on Swedish inventions of safety matches and of match-making machinery. Other

examples are the manufacture of dynamite, cream separators, primus stoves, and lighthouse lamps.

Denmark, lacking coal and water-power, has not been able to develop any great manufacturing industries beyond the preparation of butter, bacon, etc., for the world's markets.

SCANDINAVIAN PORTS

Oslo (Christiana), situated at the head of the Oslo Fiord and in the middle of the only large area of fertile lowland, is the capital and chief port of Norway. *Stockholm*, situated on channels by which Lake Malar is connected to the sea, is the capital of Sweden. Though it is an important port it suffers commercially from the freezing of the Baltic in the winter. *Gothenburg (Göteborg)*, situated at the mouth of the Gota River, has an ice-free harbour, and is better situated than Stockholm for world trade. It has, therefore, become by far the most important port of Sweden. *Malmö*, situated in the extreme south of Sweden, conducts a large percentage of Sweden's trade with Germany and is specially noted for the export of dairy produce. *Copenhagen* is the capital and only large town of Denmark. It conducts the greater part of foreign trade, and in addition is an entrepôt for the surrounding countries.

THE BALTIC REPUBLICS

Finland, Estonia, Latvia, and Lithuania are small republics which were formed from the territory of pre-War Russia.

Finland lies between the Gulf of Finland and the Arctic Ocean. In the extreme north is a strip of tundra, but the coast is ice-free because of the moderating influence of the Gulf Stream and of the westerly winds from the Atlantic. A

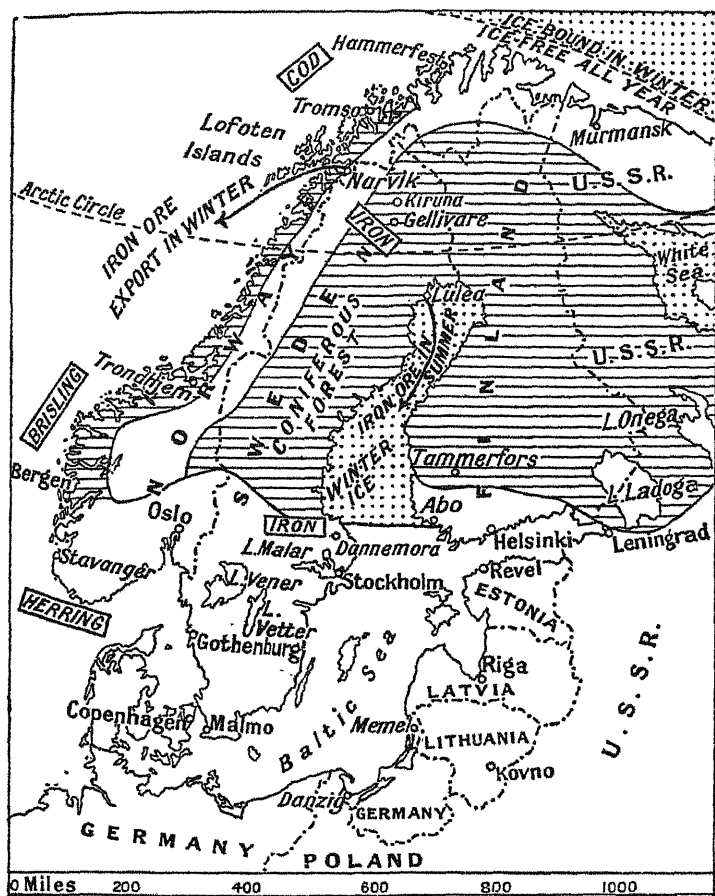


FIG. 154. SCANDINAVIA

great part of the country is covered with forests broken only by innumerable lakes which are formed by the moraine left after the Ice Age. Lumbering is one of the principal occupations, and much of the timber is used for the manufacture of wood-pulp and paper.

The extreme south of Finland was, under natural conditions, an area of deciduous forest. In this region, however, most of the land has been cleared, and as the summers are long and warm, agriculture is the dominant occupation. Dairying is the chief specialization and considerable quantities of Finnish bacon, butter, and eggs are exported to Britain and central Europe.

Helsingfors (Helsinki), the capital and chief port, is situated on a fine harbour which is protected by an island.

Tammerfors (Tampere) is occupied chiefly in the manufacture of textiles. The industry owes its origin to nearby waterfalls which are used for the production of hydro-electricity.

Estonia, which lies south of the Gulf of Finland, is inhabited by people who are akin to the Finns. The majority of the people are dependent on lumbering and farming for a livelihood, and the chief exports are timber, dairy produce, and flax. *Revel* (sometimes called *Talinn*) is the capital and chief port. *Narva* has a textile industry, the factories being run by the hydro-electricity generated by the waterfalls where the river *Narova* leaves *Lake Peipus*.

Latvia occupies the lower part of the basin of the western *Dwina*. Industrially it is more highly developed than the other Baltic republics, and in recent years dairy-farming has been greatly developed along lines similar to those of Denmark. *Riga*, the capital and chief port, was formerly Russia's principal Baltic port, and still conducts a large trade on behalf of that country. The chief exports are timber, dairy produce, and flax. *Libau* and *Windau* are ice-free ports situated

on the open Baltic. They thus have an advantage over Riga, which, being situated in a deep bay, is ice-bound for some weeks each year.

Lithuania is the most fertile of the Baltic Republics, having more than half its land under plough, another quarter meadow-land, and only one-sixth forested. As in the other republics the chief products are dairy produce and flax. *Kovno* is the capital.

From 1923 to 1939 the port of Memel, together with a strip of territory on the north bank of the Niemen, was under the sovereignty of Lithuania, though the population was predominantly German. In March 1939 Hitler annexed both Memel and the Memel-land strip to Germany, thus depriving Lithuania of her only port.

CENTRAL EUROPE

As a result of the Peace Treaties which followed the World War of 1914-18, the political map of central Europe was redrawn, and several new countries were formed. The principle followed in the setting up of the new countries was that of 'self-determination,' which meant that the people of the same race and language should be given an opportunity of becoming united independent nations.

Poland was one of the great countries of Europe in the eighteenth century, but was later divided between Prussia (Germany), Austria, and Russia. By the Peace Treaties following the Great War the Polish people again became united in one country, although the boundary was drawn so as to include a considerable number of people who are not Polish, while leaving certain other groups of Poles outside the new boundaries.

The Empire of Austria-Hungary, which was Germany's chief

ally in the Great War, was composed of people of several different races, and when the empire fell to pieces at the end of the Great War, the principle of 'self-determination' was applied to these various racial groups—that is, people of the same race and language were allowed to form one nation. Strategical and economic factors were also allowed to weigh in the fixing of boundaries in certain districts, and as a consequence these new countries included certain areas inhabited by people whose race and language differ from those of the nation within which they are included. Such groups are known as *national minorities*, and in recent years the existence of these groups, some of whom felt themselves unfairly treated, has led to much friction between the countries concerned.

Czechoslovakia was one of the new countries formed out of the former Austro-Hungarian Empire. It included the provinces of Bohemia, Moravia, Slovakia, and Ruthenia, and had a total population of over 14 millions. The Czechs, who inhabit the provinces of Bohemia and Moravia, and the Slovaks, who live in Slovakia, are closely related branches of the Slav race, while the Ruthenians are related to the Ukrainian Slavs of southern Poland and south-eastern Russia.

After the Great War of 1914-18 the boundaries of the new state of Czechoslovakia were drawn to include within the country large 'minorities' of other nationalities; on the fringe of Bohemia were about three million German-speaking people, near the boundary of Polish Silesia were about 100,000 Poles, and on the southern fringe of Slovakia about 900,000 Magyars. In 1938 Herr Hitler demanded that the boundary should be re-drawn so as to include the 'Sudeten Germans' within the Reich. This demand was complied with by the agreement of Munich, and about the same time Poland

annexed the district around the coal-mining town of Teschen, while Hungary took the lowland part of Slovakia between the Danube and the Carpathians.

Then, in March 1939, Hitler annexed outright the remainder of Bohemia and Moravia, making them 'provinces of the German Reich.' Slovakia was set up as a nominally inde-

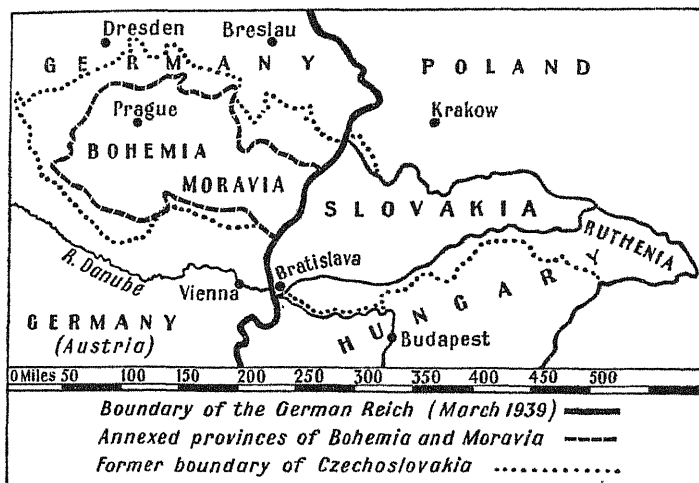


FIG. 155. NEW BOUNDARIES IN CENTRAL EUROPE

pendent province under German 'protection,' and Ruthenia was annexed by Hungary.

Yugoslavia, or the country of the South Slavs, was formed after the Great War by the union of the formerly independent countries of Serbia and Montenegro with those provinces of Austro-Hungary inhabited mainly by South Slavs. In the lowland area around the Danube the country includes many Magyars, or Hungarians; on the other hand the inhabitants of the peninsula of Istria, which is Italian territory, belong mainly to the Slav race.

Rumania has been an independent country since 1877, and fought on the side of Britain and France in the Great War of 1914-18. By the Peace Treaty which followed that War Hungary ceded to Rumania all the province of Transylvania, which is inhabited mainly by Rumanians, though it includes a considerable number of Germans and Magyars.

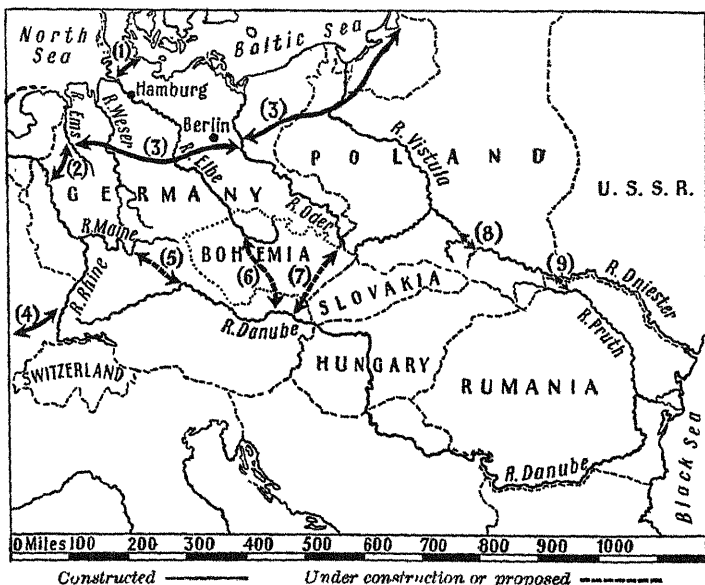


FIG. 156. CANALS OF CENTRAL EUROPE

Austria lost most of her territory by the Peace Treaties which followed the Great War, but remained as a small independent country until 1938, when it was incorporated in the German Reich by Herr Hitler.

Hungary also was deprived of her Empire by the Peace Treaties, her boundaries being drawn so as to leave her only the part of the Danubian plain inhabited in the main by

Magyars, though, as we have seen, some territory inhabited mainly by Magyars was given to the neighbouring states of Czechoslovakia, Yugoslavia, and Rumania. In 1939 Hungary not only recovered the part of Slovakia inhabited chiefly by Magyars, but also forcibly annexed Ruthenia and the neighbouring part of Slovakia through which the railway runs to Poland. The new boundaries include some Czechs in Germany and some in Hungary.

POLAND

This modern State coincides roughly with the basin of the Vistula and comprises three physical regions:

1. The Carpathians.
2. The plateau region which merges gradually into
3. The central and northern plain.

The country is predominantly agricultural, the principal crops being rye, wheat, sugar, barley, fruit, and vegetables. Industry is favoured by the existence of the large coal-field of southern Silesia, and by the occurrence of iron, zinc, lead, salt, potash, etc., in the foothills of the Carpathians.

Kracow and *Lemberg (Llov)* are ancient cities situated on the route which runs along the foot of the Carpathians. *Lodz* is the chief manufacturing city, being engaged in the production of textiles, metal goods, and leather. *Warsaw*, the capital, is situated at the natural crossing-place of the Vistula, and at the focus of the roads and railways. *Gdynia* is the chief port of Poland. Though given special trading rights in Danzig, the Poles wished to have a port of their own, and so Gdynia was transformed within a few years from a small fishing village into a well-equipped modern port.

SLOVAKIA

This nominally independent State is in actual fact entirely dependent on Germany both politically and economically.

Practically the whole of the area is occupied by the ranges and valleys of the Carpathians, and the bulk of the population are peasants who depend chiefly on the products of their flocks and herds. The country is, however, rich in timber and iron ore, and these resources are being efficiently organized for the benefit of German industries. *Bratislava*, the only large town, is situated on the Danube at the point where the boundaries of Germany, Slovakia, and Hungary meet. It is of great importance as a river port.

HUNGARY

This small country consists of part of the great plain known as the Alföld, the only area of high land being the Bakony Forest which crosses the Danube at Budapest. The country is predominantly agricultural, the chief crops being maize, most of which is consumed at home, and wheat, considerable quantities of which are exported. Large numbers of cattle are reared, and one of the chief exports is draught oxen. Though Hungary possesses a small coal-field at Pecs (Fünfkirchen), there has been little industrial development.

Ruthenia, the province which Hungary took from Czechoslovakia in 1939, is one of the most primitive areas in Europe. At least 90 per cent of the people are peasants, but the land is so infertile and the farming methods so primitive that the men can provide a livelihood for their families only by migrating each summer to the richer farm lands of Hungary or Germany.

Budapest, the capital of Hungary, is a combination of two

cities, Buda, on the rocky left bank of the Danube, and Pest on low-lying ground on the right bank. *Debreczin* and *Zeged* are the chief markets for cattle and wheat respectively, and *Tokay* has given its name to the wine produced in the surrounding district.

YUGOSLAVIA

This country is composed of the following physical divisions:

1. The Dalmatian coast and the Dinaric Alps. Here the sinking of the land has led to the formation of long narrow inlets, which, like the intervening islands and peninsulas, run parallel to the coast. The Dinaric Alps are composed of limestone, and the scenery is of the Karst type, with extensive areas of bare, grey rock, numerous swallow holes, and underground streams.

2. The mountainous region between the Dinaric Alps and the interior plains. Here there is considerable depth of soil, and the people live in small self-supporting farm communities. Prunes (dried plums) are the chief money crop.

3. The lowland drained by the Drava and the Sava. This is the most productive region of Yugoslavia. Tobacco and prunes are the main money crops, and live pigs are exported to neighbouring countries.

Belgrade, the capital, is situated at the confluence of the Sava and Danube, and at the northern edge of the trans-Balkan route via the Morava and Vardar valleys. *Nisb* is situated where the routes to Salonika and Istanbul diverge. *Spalato* (*Split*) and *Ragusa* are the chief Adriatic ports, and *Cattaro* is Yugoslavia's chief naval station.

RUMANIA

The backbone of Rumania is formed by the Carpathians and the Transylvanian Alps; to the west and north of this

range lies the province of Transylvania which was won from Hungary after the War; between the Carpathians and the Danube lies the fertile plain of Wallachia; between the lower Danube and the Black Sea is the rather barren region of Dobruja; and between the rivers Pruth and Dniester is the

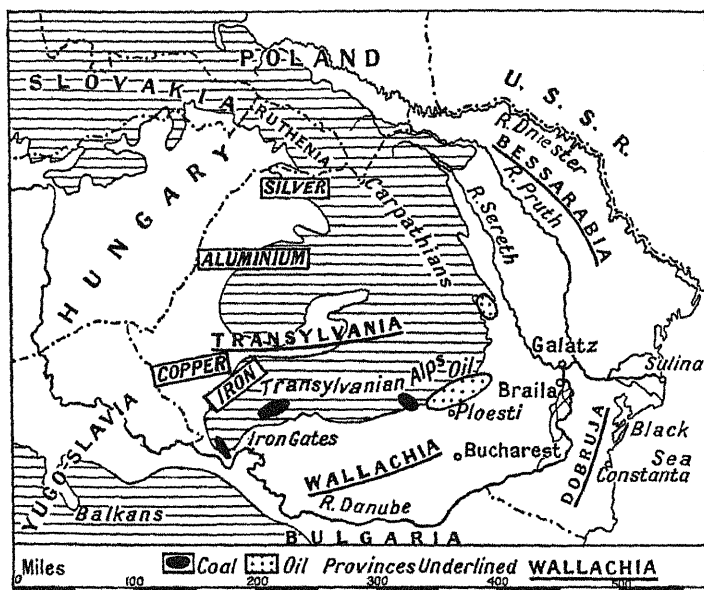


FIG. 157. RUMANIA

province of Bessarabia, which was taken from Russia at the end of the Great War.

At least 80 per cent of the people are peasants who depend on the cultivation of wheat, maize, sugar beet, and flax, etc., for a livelihood. The country is rich in minerals. Oil is produced at *Ploesti*, which supplies about 4 per cent of the world's output, and gold, silver, copper, and other metals

occur in the Transylvanian Alps. *Braila*, on the Danube, exports wheat, and *Galatz* exports both wheat and timber, the latter being cut in the Carpathians, and floated down the rivers Sereth and Pruth. *Sulina*, at the mouth of the only distributary of the Danube navigable for large vessels, suffers somewhat through the freezing of its harbour for some weeks in winter. *Constanta*, situated south of the mouth of the Danube and on the open coast, has the advantage of being free from ice, and is growing rapidly at the expense of the above-named ports.

BULGARIA

This roughly rectangular country is easily divisible into four natural regions, viz.:

1. The plateau south of the Danube, which is covered with fertile loess soil. This is the chief region for the production of wheat and maize.
2. The Balkans, which are barren mountains, providing only summer pasture for sheep and small quantities of timber.
3. The Maritza valley, which is a fertile sheltered lowland producing a great variety of crops. The most interesting speciality is the production of attar of roses, a scent made from the petals of roses.
4. The Rhodope Range, which is the most backward part of the country, although it produces some timber, and supports small flocks of sheep and goats.

Sofia, the capital of Bulgaria, situated at the western end of the country, is the natural focus of routes, and before the loss of territory to Yugoslavia after the Great War, was nearly centrally placed in the country. *Philippopolis* is the marketing centre of the Maritza valley, and *Burgas* and *Varna* are Bulgarian ports on the Black Sea.

EUROPE

TURKEY

Turkey was formerly a great European power, but her territory in Europe is now restricted to a small area west of the Sea of Marmora. *Istanbul*, as Constantinople is now called, occupies one of the finest city sites in the world, being situated on an excellent harbour (the Golden Horn) and at the point where the Mediterranean is crossed by the land route from Europe to Asia. In spite of its advantages, however, it now has comparatively little trade. *Adrianople*, situated at the head of navigation of the Maritza, controls the western entrance to Turkey.

GREECE

The backbone of Greece is formed by the Pindus Mountains whose many branches enclose isolated plains, or run out to sea as peninsulas or islands. Two peninsulas are particularly worthy of note—the three-fingered Chalcidice peninsula and the five-fingered peninsula of Morea.

The climate of Greece is of the Mediterranean type, the long, hot summers being almost absolutely rainless. The lack of water is accentuated by the fact that the mountains are built mainly of limestone, and in large areas there is no surface water. Consequent upon this lack of water and the primitive methods of farming the agricultural output is low and the people are very poor. The chief money crops are currants and tobacco. The former are produced chiefly on the southern side of the Gulf of Corinth. Though the name 'currants' was derived from Corinth, that city does not now produce or export currants, the chief centre of the industry being Patras. The tobacco is of the type known as 'Egyptian,' and most of it is exported to Egypt where it is manufactured into cigarettes.

Athens, the capital of modern Greece and the chief city of ancient Greece, is situated where the north-south land route

crosses the east to west route via the Gulf of Corinth. *Piraeus* is the port for Athens. *Corinth*, once the rival of Athens, is now little more than a village. The Corinth Ship Canal,



FIG. 158. BALKANS—PHYSICAL AND RAILWAYS

which runs across the isthmus of Corinth, is little used except by small passenger steamers. *Salonica*, the second city of Greece, is situated at the terminus of the trans-Balkan route via the Maritza valley.

ALBANIA

After the War this small country was coveted by Italy and Yugoslavia, and as neither would agree to the other having it, it was decided that it should remain independent.

In April 1939, however, Italian troops occupied the country, the king fled, and an administration entirely subservient to Italy was set up.

Italy thereby gained not only a vital strategic position *vis-à-vis* Yugoslavia and Greece, but also absolute control of the small oil-field which may eventually become an important source of oil for Italy.

Albania is probably the most primitive part of Europe, and the people are divided into clans each of which acknowledges the leadership of its own chieftain, but has little sense of unity with the other clans. Cattle-rearing is the chief mode of subsistence, but each family has also sufficient arable land to provide itself with maize and other vegetable foodstuffs.

Tirana is the capital of Albania, and *Durazzo* the chief port.

CHAPTER XVIII

EUROPE (*continued*)

ITALY

As a modern country Italy is little more than seventy years old. Up to the eighteenth century the land was divided into a number of states between which there were great differences of outlook and conditions of life. Indeed, in spite of the establishment of Fascism by Mussolini, there are still marked contrasts between various parts of the country, due partly to historical factors and partly to geographical conditions.

Northern Italy comprises two physical regions—the Alps and the lowlands of the Po basin.

The Alps form a protective wall around northern Italy, but are by no means a complete barrier. They are crossed by many passes which have always been lines of communication between Italy and northern and central Europe. In modern times many of them have been pierced by railway tunnels, such as the St Gothard and Mont Cenis.

The Alps are of service to Italy in the following ways:

1. They provide a strong strategic barrier.
2. They afford considerable protection from the cool northerly winds in winter.
3. The beautiful scenery attracts many tourists who bring in much money to the national exchequer.
4. The numerous rapid streams, fed by the abundant rain and by the melting snow and ice in summer, provide water for generating hydro-electricity and for the irrigation of the plain.

5. The sheltered valleys of the Alps are very productive, and olives, oranges, and other crops which cannot be produced on the open plains, are grown in specially favoured districts.

The northern plain is a former arm of the sea which has been filled in with sediments brought down by the rapid streams from the Alps and Apennines. It will be noticed that the river Po lies near the southern edge of the plain. This is because the Alpine rivers bring down more silt than those from the Apennines, since they not only rise at a greater height, but have also a greater supply of water than the smaller rivers from the Apennines. The process of land building is still going on, and it has been estimated that every year the river Po carries down to the sea sufficient mud to build a million square yards of land.

In the eastern half of the plain of the Po the rivers have built themselves up above the level of the surrounding country, and hundreds of miles of dykes have been built to prevent land from being flooded. In the western half of the country there is insufficient water, and a network of canals has been constructed to irrigate the land.

In northern Italy, as indeed throughout the country, the majority of the people are peasant farmers. The principal crop in northern Italy is hay, and on some of the irrigated meadows as many as seven crops a year are obtained. Great numbers of dairy cattle are kept and much of the milk is made into cheese, e.g. Gorgonzola and Parmesan. In addition to the ordinary food-crops of southern Europe (wheat, maize, grapes, and vegetables) northern Italy also produces considerable quantities of hemp, rice, and silk.

Although Italy is almost entirely lacking in coal and oil and produces few raw materials, hydro-electricity generated by the Alpine rivers has led to considerable industrial development.

Milan, the capital of Lombardy, and the chief railway centre

of the northern plain, is the chief industrial city of Italy, being concerned principally with the manufacture of textiles and machinery. *Turin* is situated where the routes along the northern and southern edges of the plain of the Po converge on the routes across the Alps, via the Mont Cenis and other passes. Like Milan it is a great railway centre and its excellent trans-

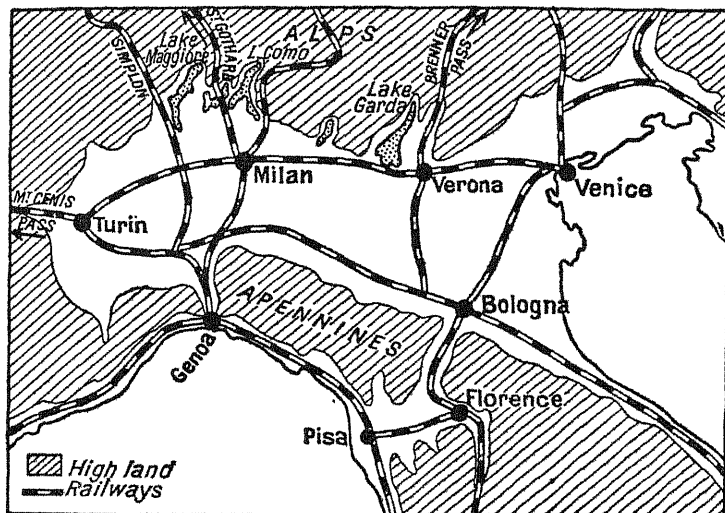


FIG. 159. NORTHERN ITALY

port facilities and abundant supplies of hydro-electricity have encouraged the growth of industry. *Venice* is built on a number of islands set in a lagoon and protected seaward by sandbanks or *lidi*. In the Middle Ages it was the foremost city of the world, and in modern times the construction of a new deep-water harbour which is connected by roads and railways and canals to the interior has again made it an important commercial port.

Genoa is the chief commercial outlet for the Po basin, and

serves a great part of central Europe. It has become the chief commercial port of Italy. *Trieste* and *Fiume* on the Adriatic coast were formerly the chief ports of Austria and Hungary. To-day, although in Italian territory, their trade is chiefly on behalf of the Danubian countries.

Southern Italy comprises the leg-like peninsula and the islands of Sicily and Sardinia. This region differs from northern Italy in the following ways:

1. It has a Mediterranean climate with warm, wet winters, and hot, dry summers, and a small range of temperature, whereas northern Italy has a continental climate with cold winters, hot summers and more rain in summer than in winter.
2. On account of the dry summers cattle-rearing is less important in the south than in the north, whereas sheep-rearing is more important in the south, especially on the Apennines.
3. Though vines are grown in northern as in southern Italy, the climate of the south is more favourable for the production of good quality wine grapes.
4. Olives, oranges, and lemons are widely grown, especially in the extreme south of the peninsula and in Sicily, whereas on the northern plain they cannot be grown because of the cold winters.
5. Whereas almost the whole of the northern plain is cultivated and highly productive, the intensively cultivated regions of southern Italy are restricted to certain lowlands which are separated by intervening high land or marshes.
6. As a consequence of the last-mentioned fact the population is more unevenly distributed in the south than in the north.
7. Southern Italy is less developed industrially than the north, manufacturing being almost confined to a few large towns.

The eastern coastal plain is narrow and in many cases rather infertile, and consequently there are few towns of importance. The main line of railways follows the coastal plain from Bologna via Ancona to the port of Brindisi.

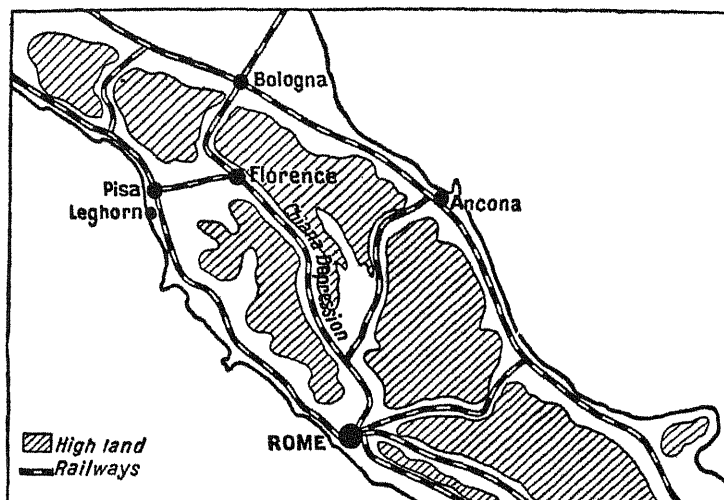


FIG. 160. CENTRAL ITALY

The western coastal plain really consists of a series of low-land basins separated by spurs of high land. These basins are:

1. The Arno basin, one of the most fertile and intensely cultivated areas of Europe. The chief towns are *Florence*, one of the chief industrial centres of Italy; *Pisa*, an ancient city formerly important as a port, but now merely an agricultural market town, and *Leghorn*, the chief port of the region and a great centre for the manufacture of straw hats, glass, and metal goods.

2. The Ombrone basin, which consists largely of malarial marshes.

3. *The plain of Latium around Rome.* In ancient times this was a fertile, well-cultivated region, but later the drainage and irrigation systems were neglected, and it became a thinly peopled malarial swamp. In modern times much of the region has again been drained and irrigated and rendered highly productive.

Rome is situated at the head of navigation of the Tiber, where seven hills dominate an island which forms a crossing place. It is, of course, the capital of modern Italy, as it was the capital of the Roman Empire.

4. *The Campagna around Naples.* Here fertile volcanic soil derived from the eruptions of Vesuvius, the tropical climate, and careful cultivation, have combined to produce one of the most productive areas in the world. Wheat, maize, oranges, olives, and lemons are the chief crops. Naples, beautifully situated on a bay at the foot of Vesuvius, is one of the chief ports of Italy, and has many industries supported partly by imported coal and partly by hydro-electricity generated in the Apennines.

Sicily is climatically one of the most favoured parts of Italy, as there is abundant rain in winter and the heat of summer is tempered by the sea breezes. The coastal region is particularly noted for oranges and lemons, but most of the interior is badly cultivated and thinly peopled.

Palermo is the chief city and port of Sicily.

Sardinia, like the neighbouring French island of Corsica, is composed of hard old rocks, which do not give much depth of soil. Pastoral industries predominate, but vines, olives, wheat, and vegetables are produced, and the deposits of zinc and lead are now being worked. There is a small coal-field which was unworked until 1938, when Mussolini formally founded the coal-mining centre named Carbonia.

THE IBERIAN PENINSULA

(SPAIN AND PORTUGAL)

The physical core of the Iberian peninsula is the Meseta, a block of hard old rock which is divided by mountain ranges into high basins such as those of Old Castile and New Castile. The northern and eastern sides of the peninsula are formed by ranges of fold mountains—the Cantabrians and Pyrenees in the north and the Sierra Nevada and the Catalanian range in the south-east and east. The Sierra Nevada runs out to sea to form the Balearic Islands, of which the chief are Majorca and Minorca. Between the plateau and the fold-ranges are low basins partly filled in with deposits derived from the neighbouring Highlands. The Ebro basin lies between the Meseta, the Pyrenees, and the Cantabrian range, and the basin of Andalusia lies between the Meseta and the Sierra Nevada. The greater part of Portugal is a lowland basin of similar structure.

Climatically the Iberian peninsula is a region of great contrast. The north-western coast lies within the westerly wind belt and has a warm moist climate, very mild winters, and warm summers. The plateau regions of the interior have a continental type of climate, and receive only a small amount of rain, since the surrounding mountain ranges rob the rain-bearing winds of their moisture. The summers are very hot and dry and the winters bitterly cold. The Portuguese lowland receives abundant rain in the winter half of the year, but in summer the rainfall is often rather scanty. South-eastern Spain has a Mediterranean climate with hot dry summers and mild winters, but even in winter the rainfall is scanty.

NATURAL REGIONS OF SPAIN

1. **The Northern Coast-lands.** This region comprises the political divisions of Galicia, Asturias, and the Basque provinces. In Galicia the chief occupations are dairying, fishing, and lumbering. *Vigo*, the chief port, is notable for its sardine fisheries. Farther east mining and manufacturing occupy a considerable proportion of the people. Excellent iron ore is mined near Gijon, Santander, and Bilbao, and some coal is mined at Oviedo. Most of the ore, however, is exported, chiefly to Britain and Germany, and only the Basque provinces have large industrial development.

2. **The Meseta** is on the whole a dry barren region devoted chiefly to sheep-rearing. In the basin of Old Castile around Valladolid large areas are devoted to the cultivation of wheat, and vines are grown in the sheltered valleys. In the La Mancha district esparto grass grows wild, and is exported for the manufacture of high quality paper.

Madrid is situated on a tributary of the Tagus, almost exactly in the centre of the peninsula. It is the centre of the railway system and has various miscellaneous industries, such as the manufacture of clothing, food stuffs, and furniture.

3. **The Ebro basin** is shut off from rain-bearing winds, and is, therefore, an arid region in which farming is difficult and the density of population rather low. *Zaragoza*, in the centre of the basin, is its chief town.

4. **Catalonia** is the most progressive province in Spain, and the most highly industrialized. *Barcelona*, the capital of Catalonia, is the chief manufacturing city of Spain, and is engaged principally in the production of textiles and iron and steel goods. Industry depends in the main on imported coal, though some electric power is transmitted from hydro-electricity power stations in the Pyrenees. *Tarragona* is a great wine-producing centre.

5. Andalusia is fully exposed to the moist winds from the Atlantic, and is therefore one of the most fertile regions of Spain. The summers, however, are so hot that irrigation is necessary for cultivation. *Seville*, at the head of navigation of the Guadalquivir, exports olive oil and oranges. *Cadiz*,

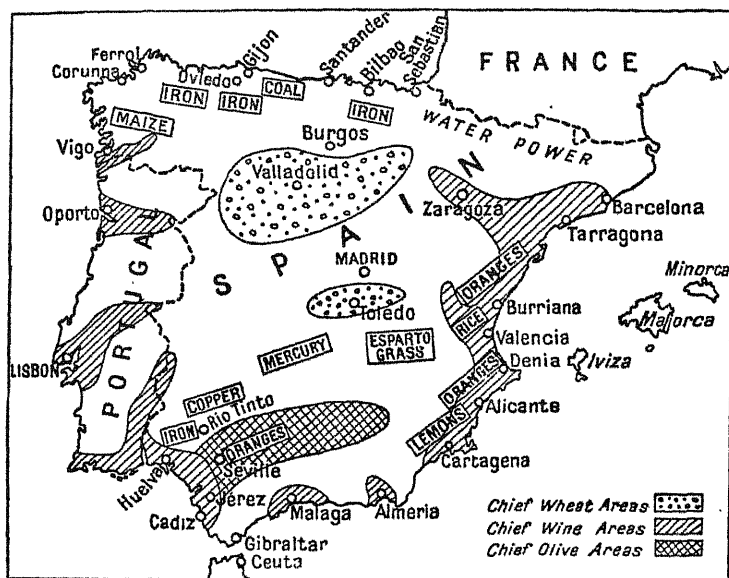


FIG. 161. IBERIA—ECONOMIC

on a deep land-locked harbour, is the chief ocean port of southern Spain. *Jerez* gives its name to the sherry produced in the locality. *Huelva* is the port for the rich mining region of Rio Tinto, where large quantities of copper and iron are produced.

6. **The South-eastern Coast-lands.** This region comprises the provinces of Granada, Murcia, and Valencia. Under natural conditions the land is too dry for cultivation, but intricate

systems of irrigation have made it one of the most productive regions of Europe. Most of the land is devoted to the production of food-crops, of which maize, rice, wheat, and beans are the chief, but the money income is derived chiefly from the cultivation of oranges and lemons on the irrigated areas which are known as 'huertas.' Valencia, Granada, Murcia, and Denia are the chief centres for the export of oranges.

PORTUGAL

Portugal is essentially an agricultural country, but farming methods are primitive and there is a large proportion of waste lands. Cattle-rearing is more important than in Spain because of the heavier rainfall, while the wetter summers favour cultivation of maize rather than wheat. Olives and oranges are widely grown, but there is little export.

The most intensively cultivated region is near the mouths of the Minho and Douro. Oporto at the mouth of the Douro is the centre for the production and export of port wine.

Lisbon, the capital, is situated on a landlocked basin at the mouth of the Tagus. A large part of its trade is with South America, especially with Brazil, which was formerly a Portuguese colony.

SWITZERLAND

This small republic comprises three physical divisions:

In the north are the simple fold mountains of the Jura; to the south of these is the plateau region known as the Swiss Foreland; and still further south are the complex fold mountains of the Alps (see Fig. 162 which shows the chief ranges and passes through the Alps, as well as the remarkable divergence of the rivers from the St Gothard pass).

The Alps are the greatest commercial asset of Switzerland. The beautiful scenery and facilities for winter sports attract tourists and holiday makers, and a very large proportion of the people—hotel workers, mountain guides, transport workers, shop-keepers, etc.—depend primarily on the tourists

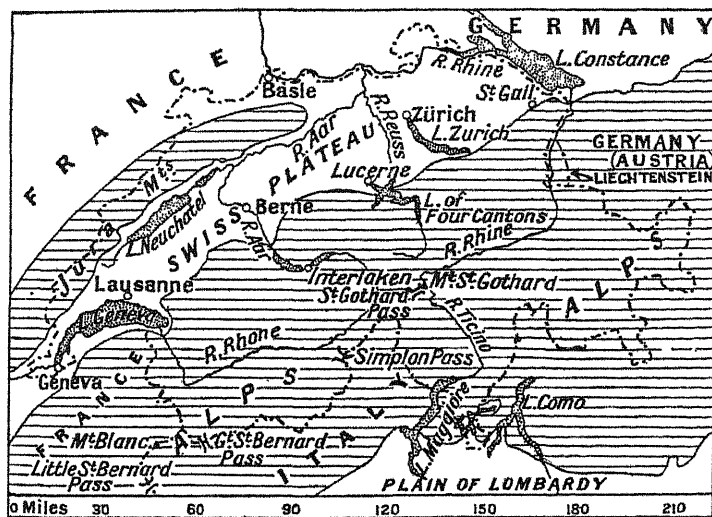


FIG. 162. SWITZERLAND

for their money income. The waterfalls have been harnessed for the generation of hydro-electricity which is used to light the towns and villages, and to provide power for the factories and railways. The Alpine valleys are highly productive. Often on the mountains there are shoulders of fairly level land between the high peaks and steep valley sides. These 'alps,' as they are called by the Swiss, are covered with snow in winter and provide excellent pasture for sheep and cattle in the summer.

The Swiss plateau consists mainly of horizontal layers of sandstone and other rocks covered with alluvial and glacial deposits. Most of it is fertile pastoral land and arable land, and dairy farming is the most important specialization.

The Jura Mountains are composed of limestone, which does not usually provide good soil. Arable farming predominates on the valley floors, while the hill slopes are devoted chiefly to the pasturing of sheep, cattle, and goats. In some districts, however, the hills are forested and lumbering is an important industry.

SWITZERLAND AS A MANUFACTURING COUNTRY

In spite of the lack of coal, iron, and other minerals, Switzerland is an important manufacturing country, more than half the people being engaged in industry. Factors which have led to the development of manufacturing in Switzerland are:

1. The skill and inventiveness of the people.
2. The influx at various times of refugees, such as the Huguenots, who introduced the watch-making industry, and Italian Protestants, who introduced the manufacture of silk.
3. The abundance of water-power which is now utilized for the generation of electricity.
4. The proximity of densely populated countries, providing markets for the manufactured goods.

The chief manufactured products exported from Switzerland are watches, dairy produce (cheese and condensed milk), fine silk goods, and electrical and scientific apparatus. These are all alike in one respect—they are valuable, but of small bulk. Their manufacture requires very little raw material, but a great deal of skill and labour, and the cost of transport is only a small part of the total cost of the finished article.

Berne was chosen as the capital of the country since it is situated near the centre. *Zürich* is the chief city for the manufacture of cotton goods, and *Lucerne*, situated on the Lake of the Four Forest Cantons, is the largest tourist centre. *Geneva*, on the lake of the same name, is the headquarters of the League of Nations and of the International Red Cross. *Basle* is situated at one of the great cross-roads of Europe, from which routes run northwards via the Rhine, southwards via the Swiss plateau to Italy, westwards via the Burgundian Gate to France, and eastwards via the Rhine to Lake Constance and central Europe.

CHAPTER XIX

EUROPE (*continued*)

GERMANY

GERMANY is divided into five natural and economical regions, as follows:

1. The southern and central highlands.
2. Austria.
3. The German plain.
4. The marginal mining and manufacturing belt between the highlands and the plain.
5. The Rhine valley.

I. THE SOUTHERN AND CENTRAL HIGHLANDS

This is a complex region which was formerly divided into many separate states. The *Bavarian plateau* lies between the Alps on the south, the Black Forest on the west, and the Swabian Jura on the north-west. Physically this region is a continuation of the Swiss plateau, but is much less fertile than the latter, and contains large areas covered with marsh and coarse gravel. Pastoral farming predominates, but rye and wheat and oats are grown, and certain districts specialize in the cultivation of hops.

Munich, the capital of Bavaria and the headquarters of the Nazi Party, is situated between the forests of the south and the marshes of the north. It is noted for the brewing of beer, and in modern times has become the greatest railway centre of southern Germany.

The Black Forest owes its name to the coniferous forests which clothe the mountain-sides. It is one of the chief sources of timber for Germany, and is a great holiday region. In some valleys there are small-scale industries, such as the manufacture of clocks, supported by electricity generated by the rapid streams.

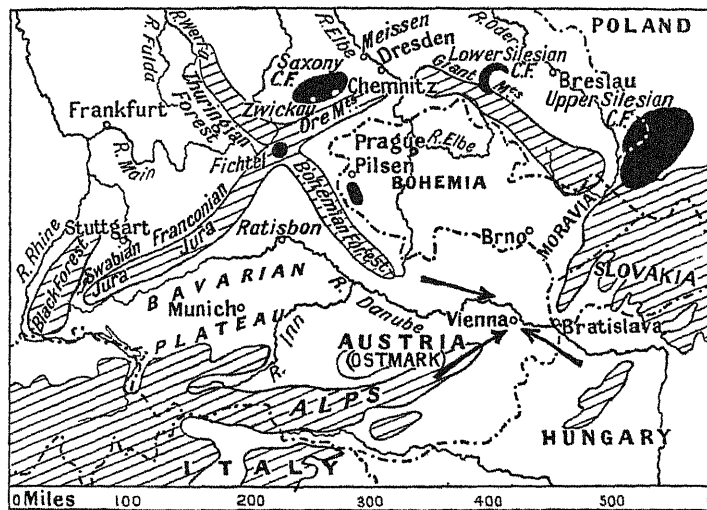


FIG. 163. SOUTH GERMANY

Between the Black Forest, the Swabian Jura, and the Thuringian Forest is a triangular area drained chiefly by the rivers Neckar and Main. *Stuttgart*, the chief city of the Neckar basin, is engaged in the production of pianos, clocks, electrical instruments, and other goods requiring a great deal of skilled labour and comparatively little raw material. The factories are driven by hydro-electricity generated on the Neckar and its Black Forest tributaries. *Nuremberg*, though not on an important river, is a great railway centre and has

many industries, such as the manufacture of glass and electrical apparatus.

2. AUSTRIA

From 1918 to 1938 Austria was a small republic shorn of her former empire and prevented by the peace treaties from joining with Germany. In 1938, although a large proportion of the people did not then wish to become part of the German nation, Herr Hitler annexed Austria, making it a province of the German Reich. The greater part of this province consists of the east to west ranges of the Alps, with deep intervening valleys, such as those of the Inn, the Enns, and the Sava.

The principal products of this region—timber, butter, and iron-ore—are among those of which Germany as a whole has a shortage. The eastern portion of the province is the fertile plain of which *Vienna* is the centre. From this city routes diverge to all parts of Europe, and the possession of this important strategic centre has undoubtedly greatly added to the strength of Germany from the military point of view.

3. THE GERMAN PLAIN

The lowland of northern Germany is crossed by the great rivers Rhine, Ems, Weser, and Elbe, while from west to east run long depressions which were formed during the Ice Age. These depressions have been utilized for the construction of canals to link up the long east to west portions of the great rivers.

The German plain varies greatly in fertility, but on the whole the portion east of the Elbe is less fertile than the western part. In East Prussia and Silesia the land is of only moderate fertility, and is mainly divided into large estates worked by farm labourers, whereas in the rest of Germany small farms owned by the peasants themselves are the general rule.

The *Baltic Heights* south of the Baltic Sea are in general sandy and infertile, and a considerable area of the land is occupied by lakes and forests. The great bay of lowland around Magdeburg, Halle, and Leipzig, though not of great fertility under natural conditions, has been improved by the addition of potash and other fertilizers so that it is now one of the most productive areas in Germany. The chief agricultural specialization is the production of sugar beet.

East of the Elbe the most fertile districts are the alluvial valleys of the Weser and the Elbe, and the coastal lowlands which are protected from the high tides by dykes. There are, however, large infertile areas, such as Luneberg Heath, east of Bremen, and the Bourtanger Moor on the borders of Holland.

Berlin, centrally situated in Germany, is well suited to be the capital of the country. In modern times it has become the centre of the railway system and has developed industries characteristic of a capital—clothing, furniture, glass, electrical apparatus, and other goods.

4. THE MINING AND MANUFACTURING BELT

The marginal belt between the southern highlands and the northern plain is one of the most densely peopled parts of Europe. Within this belt are situated many of the chief cities of Germany—Cologne, Hanover, Brunswick, Magdeburg, Halle, Leipzig, Dresden, and Breslau—which have grown up where the north to south routes cross the east to west route along the foot of highlands. Here, too, are situated many of the important mining and manufacturing areas of Germany. The chief industrial areas are:

(a) *Silesia*, where Germany still retains a small part of the Upper Silesian coal-field. The chief industries are the manufacture of cotton goods and linen goods. *Breslau*, the great

city of the region, is situated where islands in the Oder determine both the easiest crossing-place and the head of navigation.

(b) Saxony, situated to the north of the Ore Mountains, is the most densely peopled state of Germany, and one of the

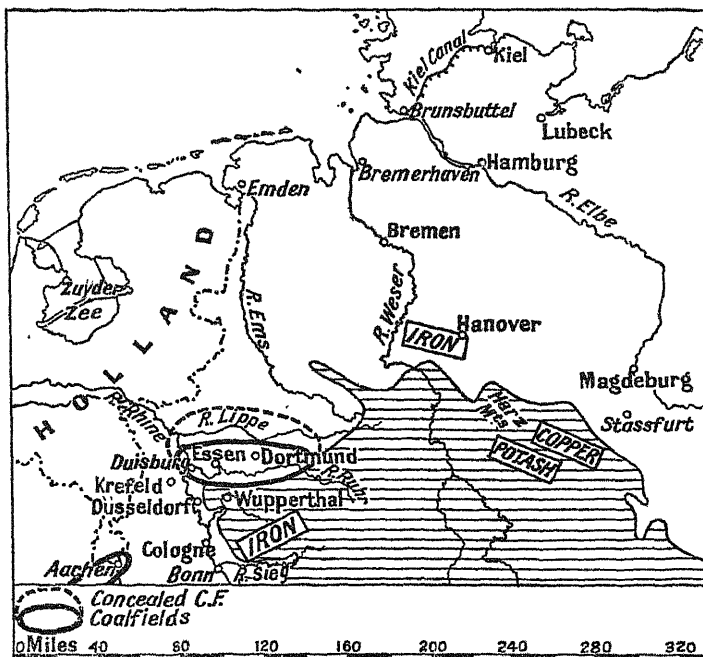


FIG. 164. NORTH-WEST GERMANY

most highly industrial areas in the world. In the valleys of the Ore Mountains various small-scale industries, which require much labour and skill but little raw material, are carried on with the aid of hydro-electricity. In the plain, however, modern industrial development has been based on the coal-

field. Textiles, metal goods, glass, and chemicals are manufactured in the densely peopled belt which stretches from Plauen in the west to Chemnitz in the east. *Dresden*, the capital of Saxony, is engaged in various luxury trades, while *Meissen*, lower down the Elbe, is the centre for the manufacture of the so-called Dresden china. *Leipzig*, in the middle of a bay of lowland, is the chief centre of the German printing and book-binding industry.

(c) **Sudetenland**, the region inhabited mainly by German-speaking people, which was torn from Czechoslovakia in 1938 and annexed by Germany. This region was the most highly industrialized part of Czechoslovakia, and accounted for at least fifty per cent of her output of manufactured goods. The chief industrial products of the region are glass, textiles, paper, chemicals, clothing, and machinery.

(d) **The Harz Mountains** which were formerly one of Europe's chief sources of copper, lead, and silver. In recent years there has been a revival in the mining industry, and margins of the area are of great importance for the various metal industries. *Stassfurt* is the centre of the mining of potash and other salts which are used in the preparation of fertilizers and in the manufacture of various chemicals.

(e) **The Ruhr district** which is drained by the Wupper, the Ruhr, and Lahn, tributaries of the Rhine. In this region is produced three-quarters of Germany's coal, as well as some iron, and it is by far the most important manufacturing area in Germany. *Essen*, *Bochum*, and *Dortmund* are the chief centres of the heavy metal industry. *Wuppertal*, which was formed by the combination of the formerly separate towns of Barmen and Elberfeld, is the chief textile centre. *Düsseldorf*, *Duisberg*, and *Ruhrort* are important ports serving the industrial district of the Ruhr. They also are busy iron and steel manufacturing centres.

(f) West of the Rhine is a small extension of the Meuse valley coal-field of Belgium. *Aachen* (*Aix-la-Chapelle*) manufactures textiles, metal goods, and glass ware, and *Krefeld* specializes in the manufacture of velvets.

5. THE RHINE VALLEY

The southern half of the Rhine valley in Germany is a rift valley formed by the sinking of the land between the Vosges and the Black Forest. The valley floor is remarkably level, and is on the whole highly productive, though near the river are some areas of marsh and infertile pebble beds.

Heidelberg is an ancient university city, situated where the Neckar leaves the Black Forest highlands. *Mannheim*, at the confluence of the Neckar and the Rhine, is one of the most important Rhine ports, and the ease of assemblage of raw materials has led to the development of great industries. *Ludwigshaven*, on the opposite bank of the Rhine, is the greatest centre of the dyeing industry in Germany.

Beyond the northern end of the rift valley is the lowland around the confluence of the Rhine and the Main, which is so highly fertile that it is sometimes called the Garden of the Rhine. Vines occupy great areas and wine is the chief money 'crop.' *Frankfurt*, one of the chief industrial and commercial centres of Germany, owes its importance to its situation at the confluence of many routes. *Mainz*, situated at the confluence of the Rhine and the Main, is a river port of some importance.

North of Mainz is the Rhine gorge, a deeply cut valley so narrow that in many places it has been difficult to find room for the roads and railways. The plateau region on either side of the Rhine gorge—Taunus, Hunsrück, Eifel, and Westerwald—are devoted chiefly to pastoral farming and the

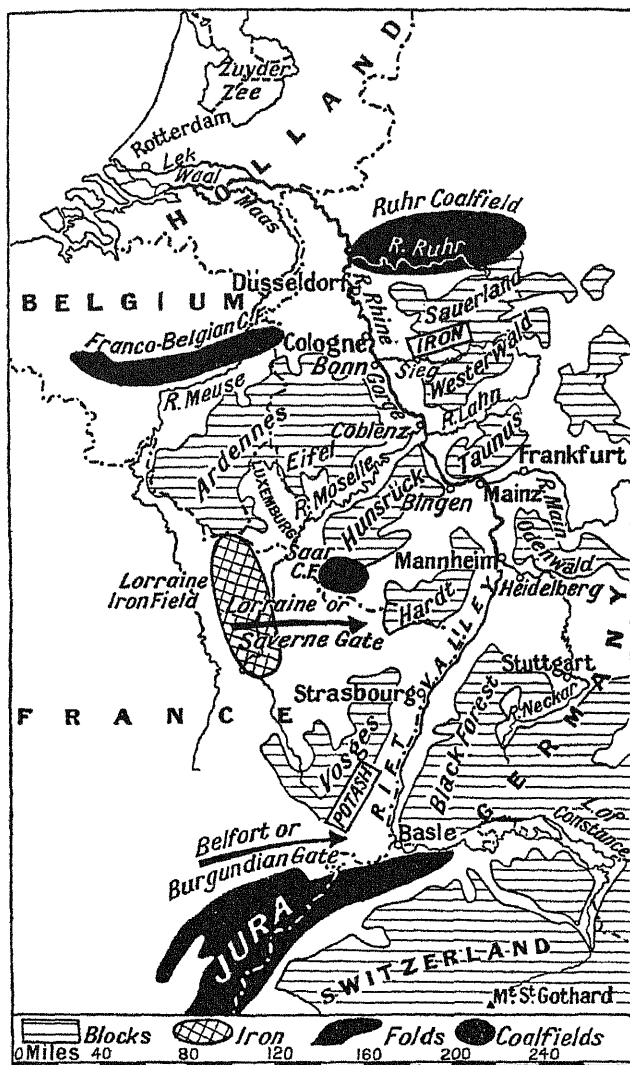


FIG 165. RHINE BASIN

production of such cool-weather crops as rye, oats, and potatoes.

Coblenz, situated at the confluence of the Rhine and the Moselle and just below the point where the Lahn enters the Rhine from the east, is the commercial centre of the region.

Cologne is situated where the Rhine valley opens out to the plain, at the point where the east-to-west route along the edge of the highlands crosses the Rhine, and at the head of navigation of the river by sea-going steamers.

It is, therefore, one of the greatest river ports of Europe, and one of the chief industrial centres of Germany.

THE GERMAN PORTS

Hamburg, situated at the mouth of the Elbe, is by far the greatest port of Germany, dealing with more than half the total trade. The factors which determined the origin and development of the city are:

1. It is situated at the lowest natural crossing place of the Elbe, for here firm sandy hills approach each bank, whereas lower down the river is fringed by flat alluvial plains, which in natural conditions were marshy and impassable.
2. Islands in the river facilitate crossing.
3. It is the head of ocean navigation.
4. The small tributary Alster provided a sheltered anchorage for ships in the early days of the port.
5. The Elbe forms the centre line of the country, and directs traffic towards Hamburg.

Bremen, situated at the lowest crossing place and at the head of ocean navigation of the Weser, is the second port of Germany, and conducts much traffic on behalf of the Ruhr, to which it is connected by canal. It suffers somewhat by the

shallowness of the estuary, and large ocean liners have to be accommodated at its outport, *Bremerhaven*.

The principal Baltic ports are: *Kiel*, situated at the entrance to the Kiel ship canal, *Lübeck*, *Stettin* (which conducts much trade on behalf of Berlin), and *Königsberg*.

Memel. When Lithuania was established as a modern state after the Great War, she advanced claims to Memel as her natural outlet. The people of the city are pre-dominantly German, and for a time the victorious allies refused to give full possession of it to Lithuania. In 1923, however, that country annexed Memel and a strip of territory on the north bank of the Niemen; but in March 1939 Hitler re-annexed both Memel and the Memel-land to the German Reich.

THE ANNEXED PROVINCES

The provinces of Bohemia and Moravia, which were annexed by Germany in 1939 when she disrupted the state of Czechoslovakia, form one of the most productive regions in Europe. Agriculturally, they are characterized by the intensive cultivation, not only of such staple food-crops as wheat and potatoes, but also such 'industrial' crops as sugar-beet and hops, which provide the raw material for the numerous sugar factories and breweries.

The industrial development of the provinces is based on the coal-fields of Pilsen and Brünn, and on iron-ore deposits in the former region. Canals to knit the provinces more closely to the German economic system are to be constructed to join the rivers Elbe and Oder to the Danube (see Fig. 156).

Prague, the former capital of Czechoslovakia, is situated in the centre of the fertile Bohemian lowland, and at the focus of the chief routes.

Pilsen is the chief industrial centre of Bohemia, and is

particularly noted for the manufacture of Pilsener beer. Nearby are the famous armament works of *Skoda*, and the great shoe-manufacturing centre of *Zlin*.

Brünn (Brno) is the chief centre for the manufacture of textiles. It has also an important armament industry.

Carlsbad, at the foot of the Ore Mountains, is a fashionable watering-place, and manufactures porcelain from nearby supplies of kaolin. In the vicinity are Europe's chief deposits of pitch-blende, from which radium is obtained.

Between Carlsbad and Pilsen are many small industrial towns which specialize in the manufacture of glass-ware and small metal goods.



K.L.M. Royal Dutch Airways

AERIAL VIEW OF THE RHINE DELTA (INFRA-RED PHOTOGRAPH)

CHAPTER XX

WESTERN EUROPE

HOLLAND

HOLLAND, or, as it is more correctly termed, the Kingdom of the Netherlands, comprises three different types of land surface, namely:

1. The coastal strip of sand dunes which have been strengthened to form protective dykes.
2. The low-lying region which is really the combined delta of the Meuse and the Rhine.
3. The eastern Netherlands which consists of deposits of sand and peat, situated well above high tide level.

Nearly all the farm land of Holland has been reclaimed either from the sea or from the moor. The land below sea-level has been made cultivable by the building of dykes, and by the pumping of the water into canals whence it is taken out to sea. On the peat moors of the east small areas have been reclaimed by mixing the peat with the underlying sand and with fertilizers.

The low-lying part of Holland is one of the most intensely farmed areas in the world. The chief specialization is dairying, but Holland differs from Denmark in the fact that most of the dairy cattle are kept on pasture land, and also in the specialization in cheese rather than butter. Alkmaar, Edam, and Gouda are the chief cheese markets. Another important specialization is the production of bulbs around Haarlem and Leiden. Market gardening is of great importance in the western district between the mouth of the Rhine and The

Hague. Sheep-rearing is carried on on the sandy island of Texel and on the poor sandy land of Brabant in the south.

INDUSTRIES AND TOWNS

Though we think of Holland as chiefly an agricultural country, more than half of the people are engaged in manufacturing and commerce. The industries have arisen chiefly because of the facilities for importing raw materials and coal.

Rotterdam is not only the great port of Holland and of central Europe, but is also a very important manufacturing centre. Its industries are based chiefly on imports of tropical products, e.g. cocoa, vegetable oils, tobacco, sugar.

Another industrial district is that of Twente in the extreme south-east of the country where there is an old-established textile industry. This area now draws much of its coal from the newly-developed Limburg coal-field in the extreme south of the Netherlands.

Amsterdam is the second great port of Holland, and is concerned principally with trade for Holland itself. It grew up in the Middle Ages at a dam at the mouth of the little river Amstell, and in these days it suffered no disadvantage by being away from the North Sea coast, as vessels were small enough to navigate the shallow Zuyder Zee. In modern times, when ships became too large to use the Zuyder Zee, ship canals were constructed to connect Amsterdam with the North Sea. The chief of these canals runs from Amsterdam to the port of IJmuiden on the North Sea coast and is capable of accommodating the largest ocean liners.

The Hague, though not the capital of the country, is the seat of the government and the administrative centre. *Utrecht* was originally a Roman fortress guarding the lowest crossing-place of the Rhine. As it is situated at the junction of the

polders of the west and the higher sandy country of the east, it has become the principal market for these regions, and it is also the chief railway centre of the Netherlands. It is connected by the Merwede Canal to the Zuyder Zee.



FIG. 166. THE NETHERLANDS

Groningen is the chief city of northern Holland. It is a great canal centre and exports some dairy produce.

Flushing and Hook of Holland are packet stations and passenger ports which, in contrast to the commercial port of

Rotterdam, are situated as far out to sea as possible so as to expedite the transport of passengers, mails, and perishable goods.

DRAINAGE OF THE ZUYDER ZEE

The greater part of the Zuyder Zee is less than 15 feet deep, and in 1927 the most ambitious scheme of reclamation that the world has known was commenced. As shown in Fig. 166 an enclosing dam has been constructed from the island of Wieringen to the opposite coast and four polders are to be constructed. Of these the north-west polder is already completed, and is bearing crops while the north-east polder is in course of construction. Locks in the enclosing dam will give access to Lake Yssel from which a new ship canal will provide a 'back door' entrance to Amsterdam.

BELGIUM

Belgium consists of two physical divisions, the northern plain and the southern plateau (the Ardennes). The plain is drained by the river Schelde and its tributaries, and the Ardennes by the Meuse, the lower course of which flows along the north edge of the plateau.

The people of Belgium are of two different types; in the north live the Flemings, who speak a language very similar to Dutch, and in the south live the Walloons who speak French. The dividing line between these two types of people runs east and west, through Brussels.

Belgium is at once both one of the most highly industrialized countries and one of the most intensely farmed countries of the world. The northern plain is, of course, the chief agricultural area. Near the coast is a belt of sand dunes which is succeeded by a belt of polder land similar to the lowland

of Holland. The Flanders plain was formerly sandy and infertile, but by careful cultivation has been made to yield a large variety of crops. The farms here are generally very small, and are often worked by the women and children of the family while the men work during the day in the neighbouring factories. Western Flanders is noteworthy for the

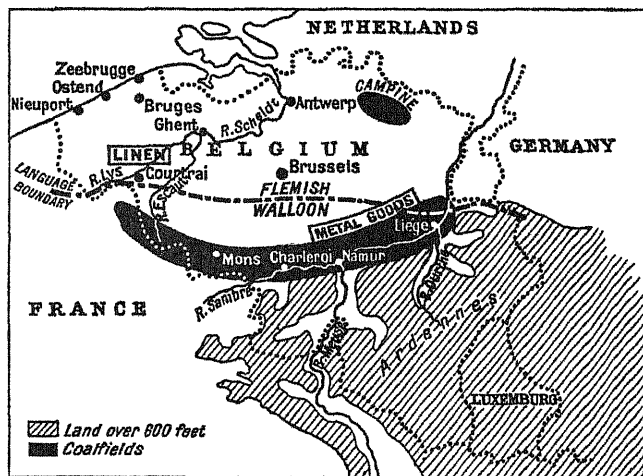


FIG. 167. BELGIUM

production of flax, and this has given rise to a linen industry in such places as Roulers, Courtrai, and Ypres.

In the southern Ardennes the soil is rather infertile, but there are large areas suitable for pastoral farming.

COAL-FIELDS AND MANUFACTURES

The Meuse valley coal-field lies immediately north of the Ardennes, the chief mining centres being Liège, Charleroi, Namur, and Mons. A new coal-field has been recently developed in the sandy Campine district in the east of Flanders.

* N

The ancient cities of *Bruges* and *Ghent* are engaged in textile industries, the former being specially noted for lace and the latter for cotton goods. In the basin of the *Lys*, in western Flanders, much of the land is devoted to the production of flax. *Verviers*, on the edge of the Ardennes, is the chief centre of the manufacture of woollen goods.

Liège and *Namur* are engaged principally in the manufacture of iron and steel, and *Charleroi* is notable for its glass. *Brussels* is well suited to be the capital of the country as it is almost centrally situated, and is, therefore, the natural focus of the roads and railways. *Antwerp*, the chief port, is situated at the head of ocean navigation of the *Schelde*. It conducts not only the major portion of the trade of Belgium, but also much trade on behalf of France and other European countries. *Zeebrugge* is a modern port situated at the seaward end of a ship canal which runs to the ancient city of *Bruges*. *Ostend* is a packet station situated at one of the few breaks in the line of coastal dunes. From it steamers ply to *Dover*. *Nieuport* is a small fishing town.

FRANCE

As shown in the sketch map (Fig. 168) France consists of eight physical divisions, namely:

1. The Cental Plateau.
2. The Rhône-Saône basin.
3. The fold mountains of the Alps and the Jura.
4. The Pyrenees.
5. The Aquitaine basin.
6. The north-western peninsula.
7. Alsace-Lorraine.
8. The Paris basin.

The Central Plateau. This is the physical core of France. It is composed for the most part of granite which forms thin soil and poor pastures. In the Auvergne district of the centre, however, there are volcanic rocks which have weathered to form fertile soils. In the south-west is the limestone region

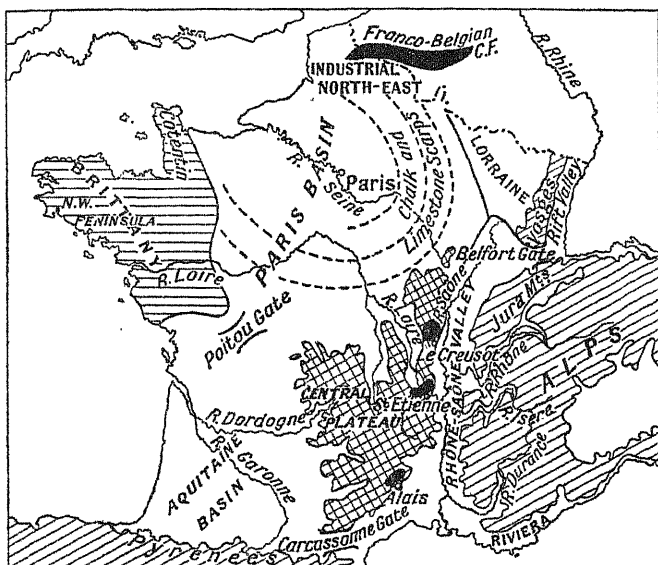


FIG. 168. FRANCE—NATURAL REGIONS

of the Causses where the scenery is of the Karst type. The dissected eastern edge forms the range of hills known as the Cevennes. Here occur the three small coal-fields of St Étienne, Le Creusot, and Alais. The chief towns of the region are: *Clermont Ferrand*, formerly an iron manufacturing centre, and now engaged in the production of motor tyres; *Limoges*, which has a pottery industry based on local deposits of kaolin formed by the decay of granite; *Le Creusot* which is the chief

centre of the armament industry of France; and *St Étienne* which manufactures silk ribbons and steel goods.

The Rhône-Saône basin is, of course, all the area drained by the Rhône and its tributaries and includes the Alps and the Jura as well as the Rhône-Saône valley.

The French Alps are similar to those of Switzerland, though, as the pastures are poorer, sheep and goats are more numerous than cattle. The Alps are of considerable value to France, as they form a well-defined frontier and also provide large supplies of hydro-electricity. *Grenoble* manufactures glass and has a famous university.

In the Jura Mountains the chief occupations are pastoral farming and the manufacture of watches and optical instruments.

The Côte-d'Or is a limestone escarpment which is specially noted for the production of wine.

The Rhône-Saône valley is a natural *couloir* or corridor between the Mediterranean and north-western Europe.

North of Valence the climate is of the continental type with cold winters and more rain in summer than winter, whereas the southern part has a Mediterranean climate. Wheat and vines are grown in almost all portions of the valley, but dairying is almost restricted to the northern half, while olives, mulberries, and walnuts flourish only in the south.

Dijon is an important railway junction situated where the railway crosses from the Saône valley to the Seine basin by a gap in the Côte d'Or.

Lyons is chiefly noted for its silk industry which is carried on in factories on the outskirts of the city. Some of the raw material is produced in the southern half of the valley, but the greater part is imported from Italy, China, and Japan. In the city itself there are also many large factories which produce artificial silk.

Marseilles is situated on a silt-free harbour a little to the east of the delta of the Rhône. It is the chief port of France, and is specially concerned with the Mediterranean and Far Eastern trade. Its industries (soap making, silk manufacture, sugar refining, etc.) are based on the raw materials which form the chief imports. In recent years *Marseilles* has been connected by a large canal to the Rhône at Arles.

Toulon is the chief French naval station.

The Riviera is a narrow strip of coast-land between the Alps and the Mediterranean. The extremely mild winters, which have made Cannes, Nice, and Mentone such popular tourist and health resorts, are due mainly to the protection from the cold northerly winds afforded by the Alps.

Cette is the centre of the largest vine-growing district of France, and is also the headquarters of the sardine and tunny fisheries.

Corsica. This mountainous island is composed of hard old rock which does not produce much soil, and consequently the island is thinly peopled, and the mode of life of the people is primitive. A large part of the surface is covered with scrub, and sweet-smelling shrubs which are known collectively as the *maquis*. The chief products are fruit, wine, olive-oil, chestnuts, and bruyère, the last named being the root of a heath-plant used for making briar pipes.

The only towns of importance are Ajaccio, the capital and birthplace of Napoleon, and Bastia the chief port.

The Pyrenees. This mountain range forms an excellent international boundary since it is crossed by very few passes. The chief value of the range to France is, however, as a source of hydro-electricity.

Narbonne and Perpignan are situated on the railway which passes round the eastern end of the range while Bayonne and Biarritz occupy similar positions at the western end of the range.

The Aquitaine basin. This lowland is formed by a down-fold in the layers of chalk and limestone which crop out round the edges. The basin is filled in with deposits of clay and sand similar to those of the Hampshire and London basins. It is drained by the rivers Dordogne and Garonne which combine to form the estuary known as the Gironde.

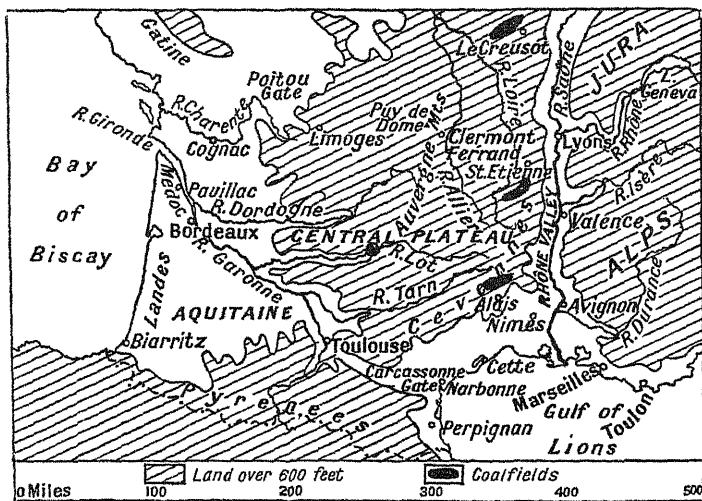


FIG. 169. SOUTHERN FRANCE

The climate is intermediate between that of the Mediterranean and that of north-western Europe. Agriculture is, therefore, characterized by a great variety of crops. The chief vine-growing districts are the Medoc peninsula south of the Gironde, and the Charente basin in the north, the latter being specially noted for the production of cognac.

Bordeaux, situated at the head of ocean navigation on the Garonne, at the lowest crossing-place of the river, and at the natural focus of the roads and railways of the basin, is the

largest city and the chief port of the region. *Pauillac* is the outpost used by the large ocean liners which cannot reach Bordeaux. *Toulouse* is the focus of roads and railways, and is the great marketing centre in the eastern part of the basin; from it roads, railways, and the Canal du Midi run through the Carcassonne gate to the Rhône valley.

The Landes district is a sandy area which was formerly used only by shepherds who moved over the marshes on stilts. In modern times, however, much of the land has been reclaimed and extensive pine forests have been planted. These provide not only timber but also turpentine, which is obtained by 'tapping' the trunks of the trees.

The North-western Peninsula. This region comprises Brittany and the western part of Normandy. The region is similar to the south-western peninsula of Britain in structure, in climate, and in the occupation of the people. The interior is crossed by granite ridges which are comparable to Dartmoor; the coast is indented by numerous rias similar to those of the Cornish coast; and fishing, dairying, and market-gardening are the chief occupations of the people, considerable quantities of dairy produce and early vegetables being exported to Britain.

St Malo is a holiday centre and is also noteworthy for the export of butter. *Brest* is a naval station and minor port comparable to Falmouth or Plymouth. *Rennes*, the capital of Brittany, is situated in a fertile basin in the interior, and is, therefore, comparable to Exeter, although it is not situated on a navigable river. *Cherbourg*, on the Cotentin peninsula, is a naval station and port of call for trans-Atlantic liners. *Nantes* is situated at the head of sea navigation of the Loire where islands facilitate crossing. As a port it suffers from the shallowness of the estuary, but is served by the outpost *St Nazaire*.

Alsace-Lorraine. Physically this region consists of the tilted

block of the Vosges together with the western half of the Rhine rift valley. Lorraine consists of alternating layers of hard and soft rock which form escarpments running roughly north and south.

Mulhouse and *Colmar* are engaged in the textile industry,

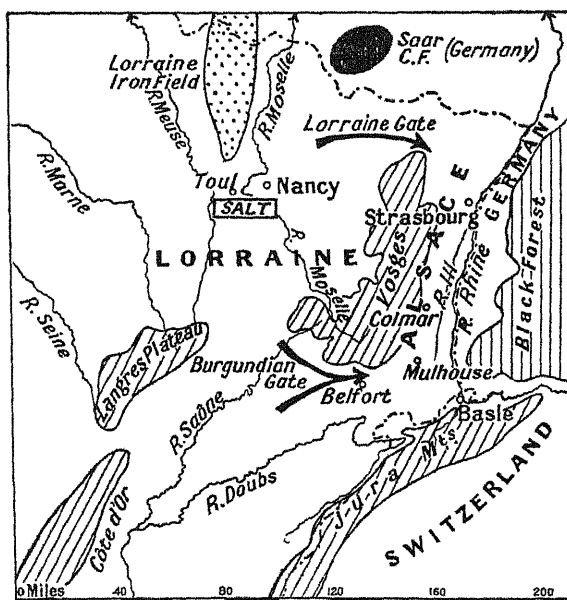


FIG. 170. ALSACE-LORRAINE

the factories being run by hydro-electricity generated by the rapid streams of the Vosges. *Belfort* guards the Belfort or Burgundian gate between the Vosges and the Jura. *Strasbourg* is situated at the confluence of the Ill and the Rhine. As it is the normal head of navigation of the Rhine, and is linked by canals to both the Seine and the Rhône, it is a very important inland port.

The *Lorraine iron-field* is the largest in Europe and the second largest in the world. The chief mining and smelting centres are Longwy, Nancy, Épinal, and Metz. Nancy has also important chemical industries based on salt and potash

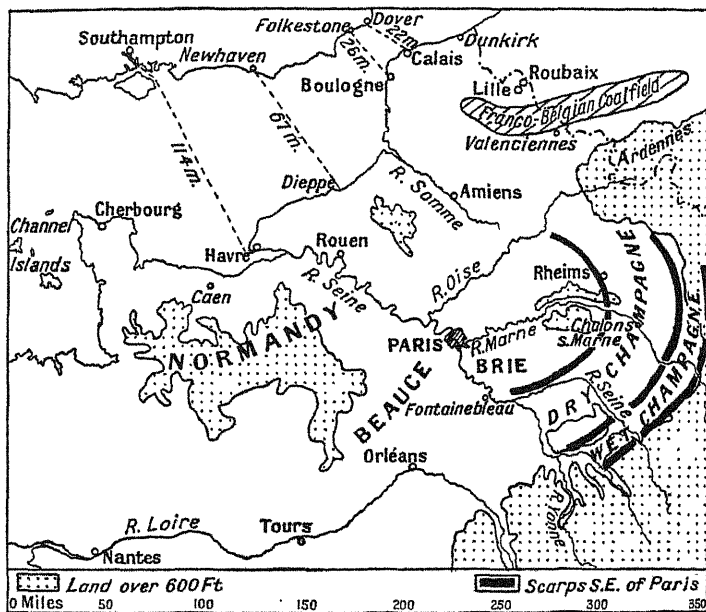


FIG. 171. THE PARIS BASIN

which are mined in the locality; several small towns on the Langres plateau specialize in the manufacture of cutlery.

The Paris basin. Like the London basin, the Hampshire basin, and the Aquitaine basin, the Paris basin is a saucer-like downfold in the chalk and the limestone. On the northern and western edges of the basin these rocks are nearly horizontal, but in the south and east they dip more sharply and form escarpments to the south of Paris (see Fig. 171).

The Champagne district consists of two parts: the Wet Champagne, a clayey lowland devoted chiefly to cattle-rearing, and the Dry Champagne, a chalk upland, the higher slopes of which are utilized for sheep-rearing while the lower slopes produce the wine which takes its name from the region.

Within the chalk scarp, is another escarpment which forms the boundary of the lowland called the Île-de-France. Here the fertility of the land and the type of farming vary greatly with the surface deposits. *Beauce*, for example, is covered with fertile limon, and is notable chiefly for the production of wheat, while *Brie* is composed chiefly of heavy clay and specializes in the production of sugar beet. Around Fontainebleau are large deposits of pure white sand which is used in the manufacture of glass.

PARIS

Factors which have led to the growth of the city are:

1. It grew up around an island in the river Seine which facilitated crossing.
2. It is the centre of the fertile Paris basin.
3. It is the head of sea navigation of the Seine.
4. It was the home of the dukes who became kings of France, and so it became the capital of the whole country.
5. As the capital of France it became the focus of the road, railway, and canal systems of the country.

Rouen is situated at the lowest bridge point and head of ocean navigation of the Seine. It is the second port of France and is one of the chief centres of the manufacture of cotton goods. *Le Havre* suffers somewhat as a commercial port through the competition of Rouen, and as a passenger port from the competition of Cherbourg, but it is nevertheless the fourth most important port of France. *Boulogne* is an important packet station to which cross-Channel steamers ply from Folkestone.

THE INDUSTRIAL NORTH-EAST

The chief coal-field of France, which is an extension of the Meuse valley coal-field of Belgium, lies in the extreme north around Lille, and this area has become the chief industrial district of France.

Lille, the largest town of the region, specializes in the manufacture of linen goods, cotton goods, machinery, and sugar. *Cambrai* and *St Quentin* are noteworthy chiefly as markets for the linen cloth which is woven in the surrounding districts. *Valenciennes* and *Arras*, though formerly textile towns, are now centres of miscellaneous industries such as the manufacture of machinery, chemicals, glass, and sugar. *Dunkirk* is the chief commercial port of the region, and *Calais* is an important packet station for cross-Channel steamers.

CHAPTER XXI

THE BRITISH ISLES

GENERAL SURVEY

Less than 100,000 years ago the land which is now the British Isles was connected to the Continent by a broad plain, but gradually the land sank about 600 feet, drowning the plain and forming the North Sea and the English Channel. The submerged plain which surrounds the British Isles and connects them to the Continent is known as the Continental Shelf, and the steep slope from the edge of the shelf to the ocean deep is known as the Continental Edge. The shallow waters over the continental shelf form excellent breeding places for shoals of fish, and the British seas are, with the exception of those of Japan, the most important fishing-grounds in the world. Other beneficent effects of the continental shelf are that the tides rise higher and flow farther up the estuaries than they would if no continental shelf existed. Moreover, the drowning of the land formed deep inlets which provide shelter for ships.

As Britain is really a part of Europe, its physical features are a continuation of those on the Continent. As shown in Fig. 172 the highlands of Scotland are continued across the North Sea in the highlands of Scandinavia; the midland and eastern plain of England is a continuation of the great plain of Europe; the chalk ridges of the North and South Downs are again met with in northern France and Belgium; the rocks which compose Cornwall and Devon are similar to those which compose Brittany; and the river system of eastern

Britain is merely part of a great river basin which formerly occupied the larger portion of the North Sea.

From the physical as from other points of view, north-



FIG. 172. PHYSICAL CONNECTIONS BETWEEN BRITAIN AND THE CONTINENT

western Britain contrasts strongly with the south-east. If a line is drawn from the mouth of the Tees to Portland Bill, the land to the north-west of this line is composed of hard old rocks which form mountainous country, while to the south-east

the rocks are newer and less resistant to the weather, and so form broad plains and basins separated by low escarpments.

Climatically, Britain is typical of the north-west European

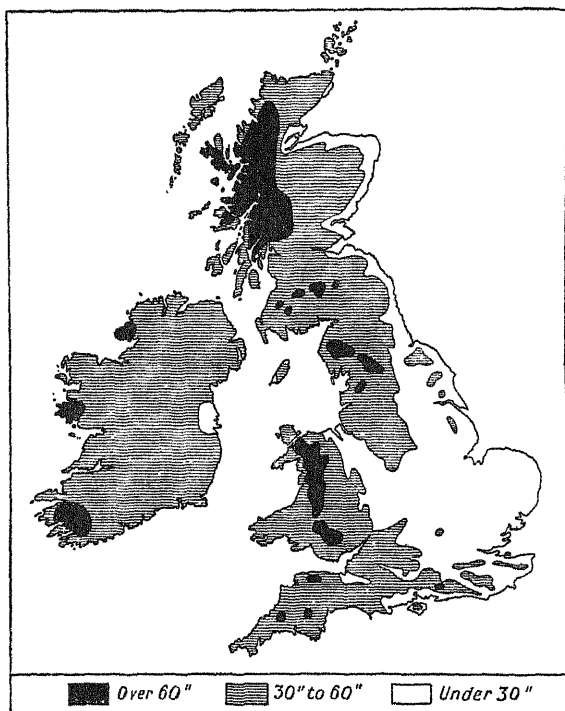


FIG. 173. BRITISH ISLES—ANNUAL RAINFALL

region. The prevailing winds are the westerlies, which rise as they encounter the mountains of the west and deposit much rain. When they reach the eastern side of the country they have lost most of their moisture; thus we find that the western side of Britain has rainfall varying from 40 inches on

the lowlands to 80 to 100 inches on the highlands, while in eastern England the rainfall varies from 20 inches to 30 inches. The winters of Britain are remarkably mild for the latitude. This is due in the main to the mild, moist south-westerly winds, but the warm waters of the Gulf Stream piled up on the

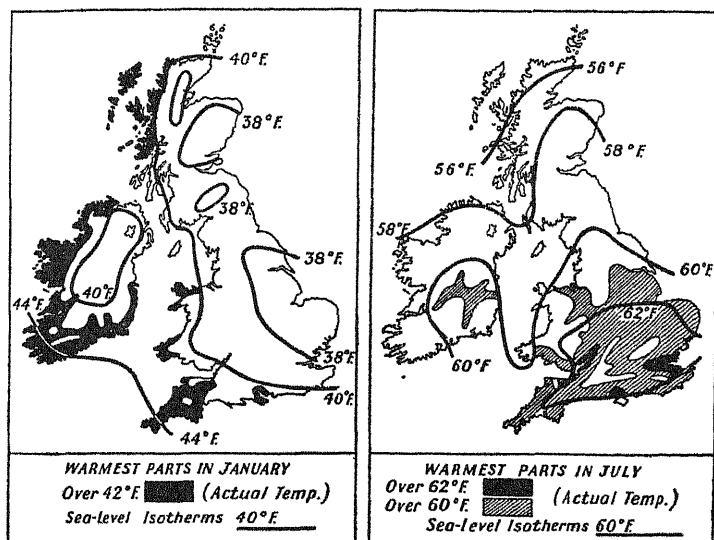


FIG. 174. BRITISH ISLES—TEMPERATURE

continental shelf also have a considerable ameliorating effect. The isotherm map, Fig. 174, shows that western Britain, which is fully exposed to oceanic influences, is much warmer in winter than eastern Britain, which is exposed to continental influences. In summer the temperatures are almost normal for the latitude, the warmest area being around London and the coolest in the north-west of Scotland.

Farming. In spite of the great growth of manufacturing and

commerce in modern times, farming is still the greatest single industry of Britain, occupying about 10 per cent of the people.

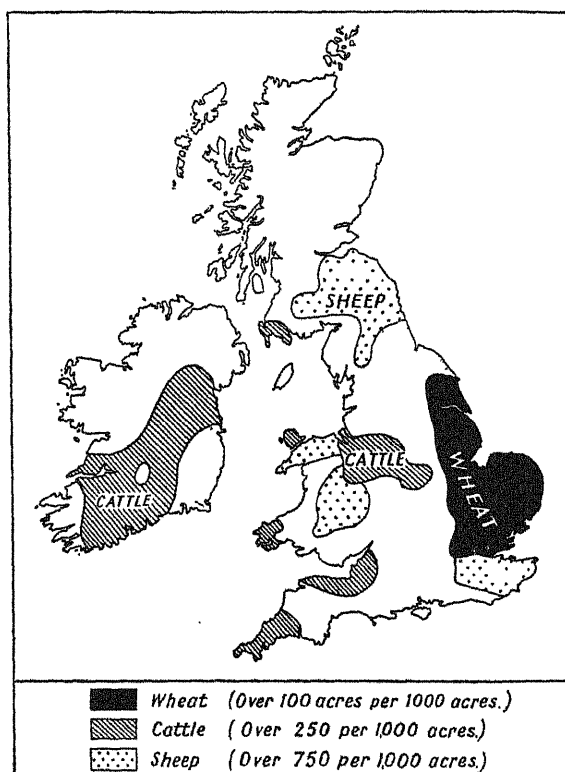


FIG. 175. BRITISH ISLES—CHIEF WHEAT, CATTLE, AND SHEEP AREAS

Almost everywhere farming is of a mixed character, but the dominant type in any region is determined chiefly by the relief, climate, and soil. Thus, in the mountainous region of the west there is only rough grazing suitable for sheep; on

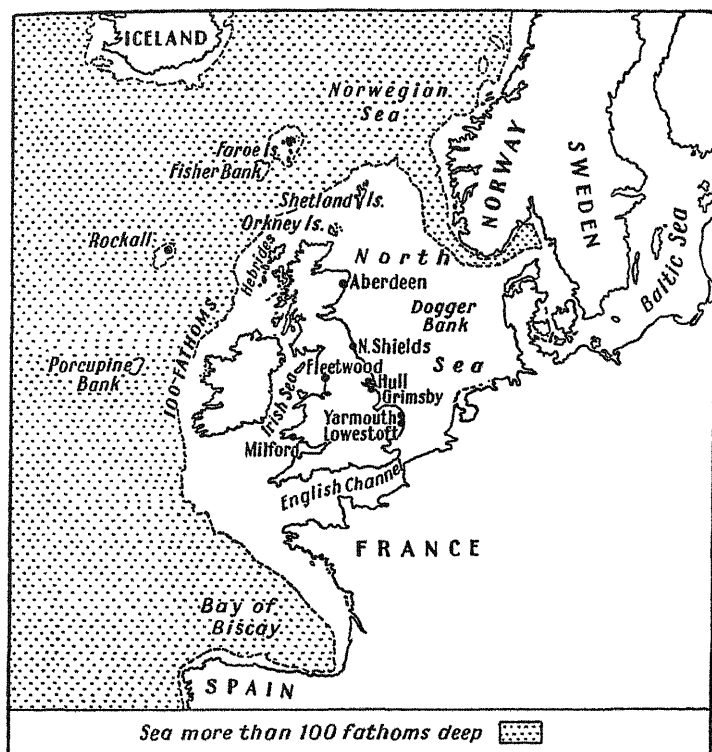


FIG. 176. NORTH-WESTERN EUROPE—CHIEF FISHING AREAS AND BRITISH FISHING PORTS

the mild, moist lowland of the west meadow grass grows well and this favours the keeping of cattle both for milk and beef. In the drier, sunnier eastern plains of Britain there is a much larger proportion of arable land than in the west, and in the district around the Humber and the Wash the chief money crop is wheat.

The chief *sheep-rearing* districts of the British Isles are; the

mountainous districts of the west where the hill pastures, though receiving abundant rain, provide a dry foot-run for the sheep; the limestone and chalk escarpments of the south-east; and certain arable areas where the sheep are 'folded' and fed on clover, turnips, etc.

Cattle-rearing is carried on chiefly on the mild, moist lowlands of the west. All cattle-rearing areas within easy access of large centres of population find it most profitable to specialize in the production of fresh milk for daily delivery. More remote cattle-rearing areas specialize in either the raising of young stock for sale or in the production of butter or cheese.

Wheat-growing is most successful in eastern England because there the summers are warm, dry, and sunny, and the level or undulating land facilitates farming operations.

Fruit-growing and market-gardening are most successful where the winter is mild, the spring early, and the soil light and warm, and where there are good transport facilities. Specially important fruit-growing areas are south-eastern Kent, the vale of Evesham, certain parts of the Fen-lands, and the northern coast of the Firth of Tay.

Fishing. Britain's chief fishing-grounds are in the North Sea, but our fishing fleets visit more distant grounds, such as the Norwegian coast, the Bay of Biscay, the Moroccan coast, Iceland, and Newfoundland. The principal fish landed at British ports, in order of value, are cod, haddock, herring, plaice, and hake.

SCOTLAND

Fig. 177 shows that Scotland is divisible into four main structural elements, viz.:

1. **The Northern Highlands**, a very thinly peopled, barren, mountainous region. Large areas are merely grouse moors and deer forests, and the population is centred almost entirely

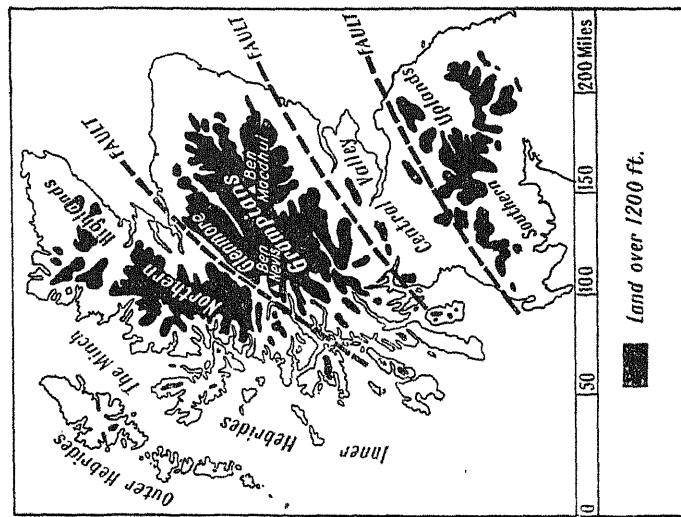


FIG. 177. SCOTLAND—PHYSICAL

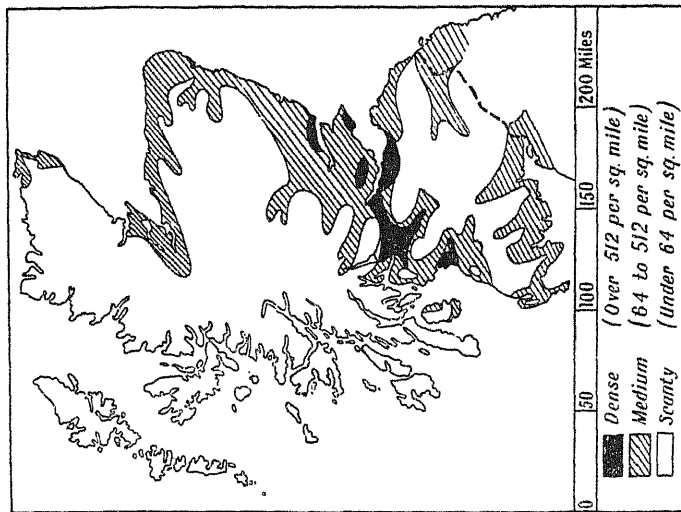


FIG. 178. SCOTLAND—POPULATION

on the coastal plains. In the Western Isles the type of life is known as crofting. Each family has a small farm, or croft, which is divided into arable land and meadow land, and, in addition, has grazing in common with others on the hill slopes. A scanty livelihood is eked out by fishing and by the home manufacture of tweeds.

2. **The Grampian Highlands** which are separated from the Northern Highlands by the long trench known as Glenmore. The sea lochs and land lochs which occupy this trough are linked together by the small ship canal known as the Caledonian Canal. The Grampian Highlands are even higher and wilder than the Northern Highlands, but on their coastal fringes the population is somewhat more dense. The only area in northern Scotland which is at all densely peopled is the north-eastern coastal region, where the soil, though thin, is very fertile and where there are numerous fishing ports. On the western side, south of Glenmore, are several hydro-electric stations where electricity is generated for the smelting of aluminium.

3. **The Central Valley.** This valley was formed by the sinking of the land between parallel faults and is, therefore, a good example of a rift valley. The region is not entirely a plain, but is crossed by a range of hills running from the Firth of Clyde to the Firth of Tay. Between this range of hills and the edge of the highlands is a broad vale known as Strathmore.

The sinking of the land during the formation of the rift valley has had certain very beneficial effects: the newer, softer rocks which provide good soil were preserved; coal measures which have been worn away from the higher land to the north and south were also preserved in basins; and deep inlets, such as the Firth of Forth, the Firth of Clyde, and the Firth of Tay were formed.

Both agriculturally and industrially the central valley is



LOCH CORIUSK, SKYE

J. Valentine & Sons

the most important part of Scotland. Mixed farming is carried on throughout the area, but the wetter west specializes in the raising of cattle, in dairying, and in the cultivation of oats and potatoes; while the drier, sunnier east has more arable

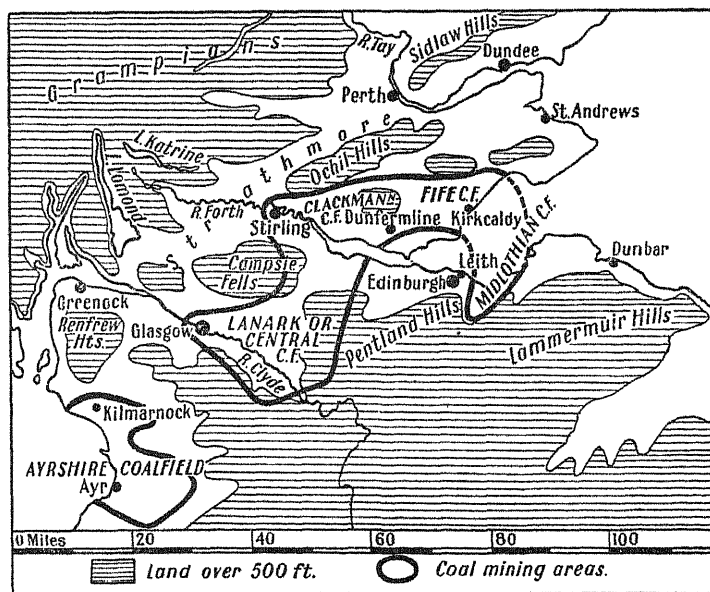


FIG. 179. CENTRAL AND SOUTHERN SCOTLAND

land and produces more wheat and keeps more sheep. Fruit-growing is of local importance in the Carse of Gowrie, north of the Firth of Tay, around Blairgowrie in Strathmore, and south of Glasgow.

Industrial development is based on deposits of coal and iron and on the facilities for ocean transport provided by the great estuaries.

The chief coal-field of the central valley is that of Lanark-

shire, which produces about half the total output of Scotland. Formerly, iron ore was obtained nearby, and though this is nearly exhausted the iron and steel industry is still maintained by the importation of iron ore, pig iron, and steel. The chief iron and steel centres are Falkirk, and a group of towns in the Clyde valley—Coatbridge, Airdrie, Motherwell, etc. The Clyde estuary is the greatest ship-building area in Britain, and indeed in the world, Greenock, Port Glasgow, Dumbarton, and Clydebank being the chief centres.

The eastern coal-fields support local industries, such as the manufacture of jute (Dundee), linen (Dunfermline, Kirkcaldy, Dundee), and linoleum (Kirkcaldy). About one-third of the coal raised from the eastern coal-fields is, however, exported from Leith, Granton, and other ports.

Glasgow, the largest city and port of Scotland, is situated at the head of ocean navigation and at the lowest crossing point of the Clyde and at the focus of land routes. Its chief industries are ship-building, engineering, and the manufacture of curtain net. *Paisley*, nearby, is the chief centre in Britain for the manufacture of cotton thread.

Edinburgh grew up around the Castle Rock which guards the coastal route from England into the Scottish lowlands. Like most capitals, its chief industries are printing and the preparation of food-stuffs such as flour and sugar. Its port, *Leith*, is now included within the city boundaries.

Stirling and *Perth* are ancient cities situated at the lowest crossing point and head of navigation of the rivers Forth and Tay respectively. Stirling manufactures woollen goods, and Perth is noted for its dye works.

4. **The Southern Uplands.** This region is one of the most important sheep-rearing areas of the British Isles, the sheep being most numerous on the hilly land of the centre and the drier land of the east. On the western lowlands of Ayr-

shire and Kirkcudbright dairying is the chief specialization. On the eastern side, in the basin of the Tweed, much of the land is under plough, and some wheat, as well as oats and roots, is produced.

At Galashiels, Selkirk, Peebles, and other centres in the Tweed basin a long-established woollen industry still survives. Lack of local coal and distance from markets have compelled the district to specialize in the production of high quality tweeds.

Southern Scotland has more railways than would be justified by its density of population. The reason is that the railways were constructed to link the central valley of Scotland with northern England and London. Study of the atlas map will show how the railways utilize the river valleys and the coastal plains.

NORTHERN ENGLAND

The physical elements of northern England are shown by the maps on pp. 384 and 386.

The Lake District consists essentially of a worn-down dome with three areas of specially high land. As will be seen from the atlas the valleys radiate from the centre like spokes from the hub of a wheel. The trough which contains lakes Windermere, Rydal, Grasmere, Thirlmere, Derwentwater, and Bassenthwaite provides an easy route across the middle of the region.

The mountain slopes or 'fells' are utilized for sheep-rearing and the alluvial valleys yield meadow grass for dairy cattle. The beautiful scenery and comparatively easy access from other parts of Britain have made the Lake District one of our principal holiday areas. *Keswick* is a market town and tourist centre and has a small pencil industry which was founded in the days when graphite was mined locally.

The Vale of Eden is in the rain-shadow of the Cumbrian

mountains, but it is an important cattle-rearing area. Fresh milk is sent daily to Newcastle and Manchester and London. *Carlisle* is situated at the lowest crossing point of the river

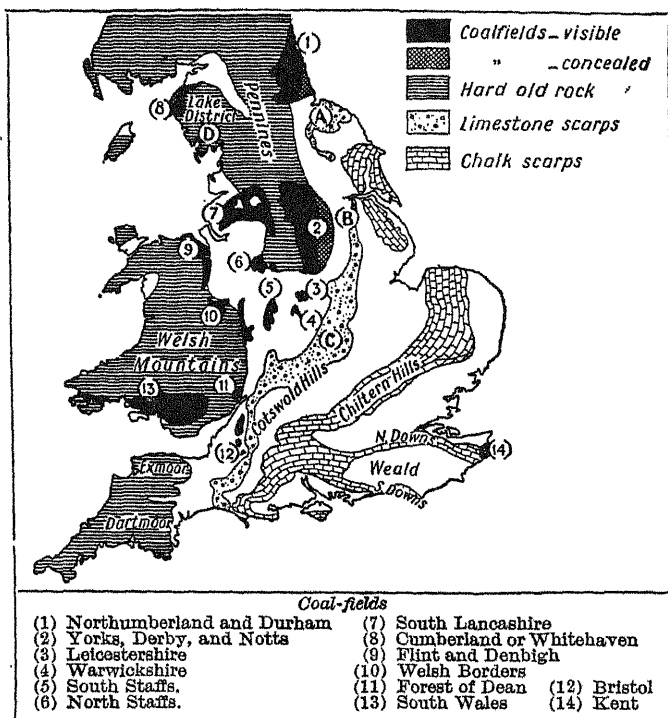


FIG. 180. ENGLAND AND WALES—GEOLOGICAL AND COAL-FIELDS

Eden and at the focus of routes following the coastal plain, the Eden valley, and the Tyne gap.

The Pennines are divided into three parts by the Tyne gap, the Stainmore pass, and the Aire gap.

The northern Pennines, between the Tyne gap and the

Stainmore pass, are a tilted block composed chiefly of limestone and sandstone which form rather barren moorland sheep pastures. The central Pennines, between the Stainmore pass and the Aire gap, are composed chiefly of limestone. Here is found the karst type of scenery described on p. 327.

The southern Pennines are a great arch which has been partially worn away. In the northern part the summits are formed by the sandstone known as millstone grit. Here are barren heather moors and peat bogs which serve as the gathering-ground for the numerous reservoirs which

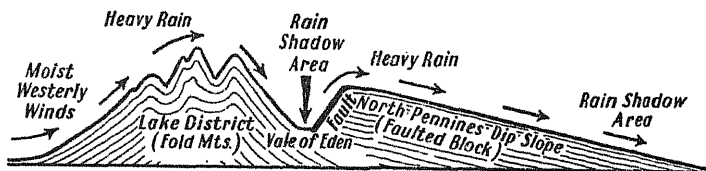


FIG. 181. DIAGRAM SECTION ACROSS NORTHERN ENGLAND SHOWING STRUCTURE AND RAINFALL

supply water to the industrial districts of Lancashire and Yorkshire. In Derbyshire the south Pennines are composed chiefly of limestone, and here, as in the northern Pennines, the land is largely used for sheep-rearing. Two westward extensions of the Pennines are the so-called 'forests' of Bowland and Rossendale. The Bowland forest is a thinly-peopled pastoral upland, whereas the valleys of the Rossendale forest are highly industrialized and densely peopled, though the high land is barren, unpeopled moor.

The Lancashire and Cheshire plain lies between the west coast, the Welsh mountains, the Pennines, and the Lake District mountains. At the foot of the Pennines is a highly industrialized region, but the greater part of the plain is a rich farming country. In Cheshire the principal specialization is in dairying. Around Ormskirk potatoes are grown, and

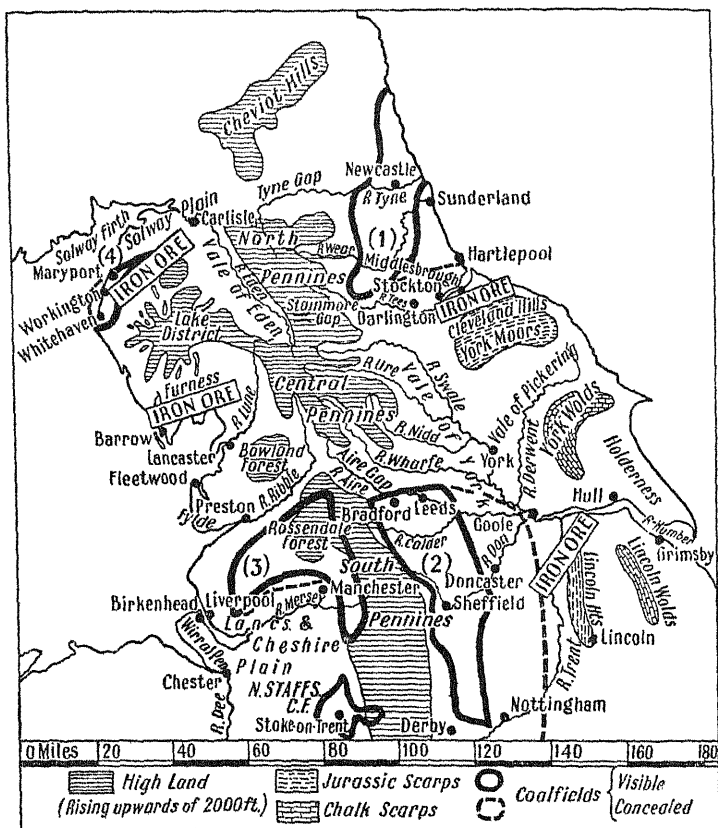


FIG. 182. NORTHERN ENGLAND

1. Northumberland and Durham Coal-field; 2. York, Derby, and Notts Coal-field; 3. Lancashire Coal-field; 4. Cumberland or Whitehaven

the Fylde district is specially noted for poultry rearing. Ancient towns are situated where the south-to-north route crosses the estuaries of the rivers; thus, Chester is situated at the former head of navigation of the Dee, Warrington at the head of navigation of the Mersey, and Preston and Lancaster in similar positions on the Ribble and Lune respectively. On the coast have grown up great holiday resorts, such as Blackpool and Southport, which serve the industrial districts of the north of England.

In the east and north-east of Yorkshire are the escarpments known as the **York Wolds** and the **North York Moors**. The former are composed chiefly of chalk, the latter of limestone. The northern part of the York Moors is known as the *Cleveland Hills*, and here the rock contains rich deposits of iron ore. Between the Moors and the Wolds is the broad drained plain known as the Vale of Pickering, and between the Wolds and the Humber is the alluvial plain of Holderness. The chief type of farming on the wolds is sheep-rearing, though there is also a considerable amount of arable land. Holderness is part of the great wheat land of eastern England.

The **Plain of York** is drained by the river Ouse and its tributaries. It has a drier, sunnier climate than the Lancashire and Cheshire plain, and has, in consequence, more arable land and produces much more wheat than the western plain. *York* grew up at the head of navigation of the Ouse at the point near the centre of the plain where sandy ridges provide a dry route across the plain.

COAL-FIELDS AND MANUFACTURING AREAS OF NORTHERN ENGLAND

The coal-fields of northern England form a great U around the Pennines, the western limb of the U being formed by the Cumberland coal-field, the south Lancashire coal-field, and the north Staffordshire coal-field, while the eastern limb is formed

by the York, Derby, and Notts coal-field and the Northumberland and Durham coal-field. Both south-east Lancashire and the West Riding of Yorkshire specialize in the textile industry, the former in the making of cottons, the latter in the

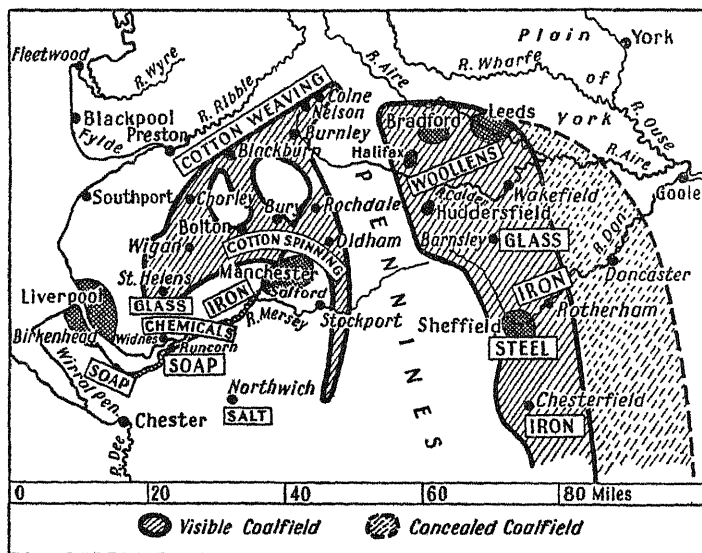


FIG. 183. LANCASHIRE AND YORKSHIRE INDUSTRIAL AREAS

making of woollens. The conditions which gave rise to these industries are similar in both areas, namely:

1. The abundant water-power from the Pennine streams (now little used).
2. Clear soft water from the moorlands, which facilitates washing of the wool in Yorkshire, and provides suitable water for dyeing and bleaching in both the cotton and the wool areas.
3. Abundance of coal, which came into use during the Industrial Revolution.

4. Sufficient iron ore for making the machinery in the early days of the textile industry, and

5. Deep valleys which could be utilized by roads, canals, and railways.

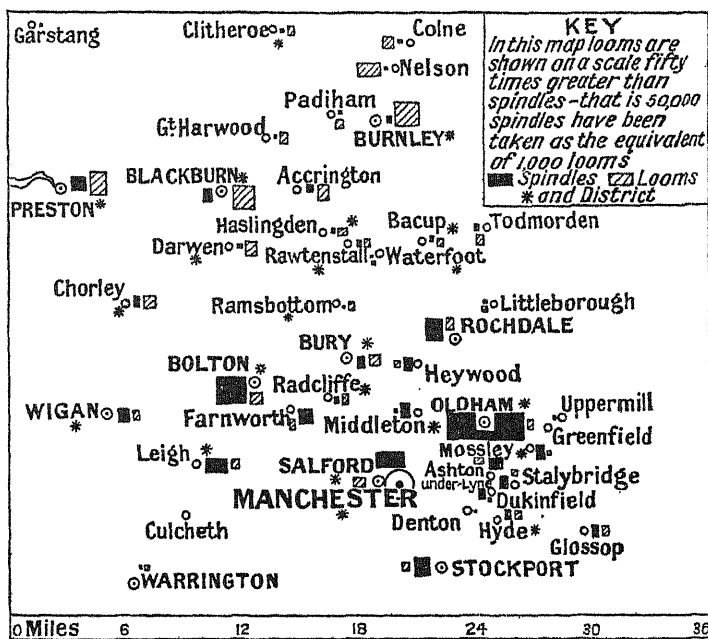


FIG. 184. LANCASHIRE—COTTON MANUFACTURING

By permission of the Editor, 'Manchester Guardian Commercial Supplement.'

Both regions in early times were woollen manufacturing areas, but whereas during the Industrial Revolution Yorkshire continued to manufacture woollen goods, Lancashire changed over to cotton, partly because she was in easy touch with the markets and partly because of her moist climate.

The Lancashire cotton industry is concentrated in two arcs

of towns around Manchester. The towns of the inner arc—Bolton, Bury, Oldham, Stockport, etc.—specialize in the spinning of cotton, while the towns of the outer arc—Burnley, Accrington, Blackburn, etc.—specialize in weaving. The valleys crossing the Rossendale forest and connecting the two arcs specialize in bleaching, dyeing, and finishing. *Manchester* is the great centre and market for the cotton industry and has also many miscellaneous industries. Since the construction of the Manchester Ship Canal it has grown rapidly as an ocean port and is now fourth in order of the total value of its trade among the ports of Great Britain. *Liverpool* first developed as a cotton port in the early days of the Industrial Revolution, and its growth has kept pace with the development of industry in Lancashire and the north of England as a whole. In spite of the construction of the Manchester Ship Canal, it still imports the bulk of the cotton used in Lancashire and maintains its position as the second port of Britain. *Birkenhead*, on the opposite coast, is a great ocean port and ship-building centre.

The **Yorkshire woollen industry** is concentrated in the valleys of the Aire and the Calder. *Bradford* is the centre and market of the industry, other important centres being *Huddersfield*, which manufactures high-quality suiting; *Halifax*, which specializes in blankets and carpets; and *Batley* and *Dewsbury* which specialize in shoddy (cloth remanufactured from woollen rags). *Leeds*, the largest town of the region, is not specially concerned with wool manufacture, though it is the greatest centre in the world for factory-made clothing. Like Manchester, it has many miscellaneous industries, such as engineering and the manufacture of chemicals, soap, and boots and shoes. *Hull*, which grew up where the deep-water channel of the Humber comes close to the northern shore, and where the small river Hull formed a convenient anchorage for the small

ships of early days, is the third port of the United Kingdom. In spite of its proximity to the woollen region of the West Riding it imports less than one-quarter of the wool used, and is much more important for the importation of food-stuffs, such as wheat and dairy produce, and of timber. Its industries are largely based on its imports. They are flour-milling, and the manufacture of paint, the basis of the latter being linseed oil obtained from countries round the Baltic. *Goole* is a smaller port situated at the confluence of the Aire and the Ouse, and at the limit of navigation for sea-going vessels. It is principally concerned with the export of coal.

The steel industry of Sheffield owes its origin to local iron ore, local water power, and abundance of timber, which provided the charcoal formerly used in smelting. Nowadays, all the iron ore is brought from other districts of Britain or from overseas, and neither water-power nor charcoal is used. However, the industry has continued to expand, and Sheffield is now one of the world's greatest producers of both light steels, such as cutlery, and heavy steel castings and forgings. *Rotherham* and *Chesterfield* are engaged principally in the iron industry. *Doncaster*, which grew up around a fortified crossing of the river Don, is an ancient city which has become an important railway and engineering centre in modern times. At the southern tip of the coal-field are two great cities, *Nottingham* and *Derby*, the former engaged in the manufacture of lace and engineering, the latter chiefly notable for the building of locomotives and the manufacture of artificial silk goods.

The north-eastern industrial area lies between the east coast, the north Pennines, and the Cleveland Hills. The industries of the area have been built up on the supplies of coal from the Northumberland and Durham coal-field, iron ore from the Cleveland Hills, and salt which is obtained from

borings north of the Tees. Though most of the iron used in the north-east is now imported, the region still remains one of the most important areas in the world for ship-building and general engineering. The great manufacturing towns are situated around the estuaries of the Tyne, Wear, and Tees. *Newcastle*, like so many other great cities, grew up at the head of navigation and at the lowest suitable crossing-place of the river. Its chief industries are shipbuilding and general engineering. Other towns engaged in the same group of industries are Gateshead, Jarrow, and South Shields, while North Shields is the most important fishing town of the area.

Sunderland, the only large town on the estuary of the Wear, is also engaged in ship-building and marine engineering. *West Hartlepool*, at the mouth of the Tees, is another ship-building town. *Middlesbrough*, which grew up very rapidly about 1870 when the Cleveland iron ore began to be used, is engaged principally in engineering, a speciality being the building of bridges. *Stockton* is a general engineering centre, *Billingham-on-Tees* has a great chemical industry based on local salt and coal, and *Darlington*, situated on the gateway between the Pennines and the Cleveland Hills, is specially noteworthy for railway engineering.

The north-western industrial area embraces the Cumberland, or Whitehaven, coal-field and the Furness iron district. The coal-field produces only about one per cent of Britain's output of coal, and does not support any notable local industry.

Iron ore is, however, mined at Cleator Moor, and near *Dalton* in the Furness district of Lancashire, and *Barrow* is an important engineering and ship-building centre. *Maryport*, *Workington*, and *Whitehaven* are minor ports on the coal-field.

THE MIDLANDS AND EASTERN ENGLAND

The Midland Plain is a triangular area situated between the south Pennines, the Welsh mountains, and the limestone escarpment which is a continuation of the Cotswolds. As the heart of England, it appropriately combines the characteristics of the industrial north and of the agricultural south-east. Of its four coal-fields, only those of north Staffordshire and south Staffordshire are great industrial areas. The Leicestershire coal-field produces only sufficient coal for local needs, and the Warwickshire coal-field, which is now the chief coal-producing area of the Midlands, sends much of its coal to south Staffordshire.

The area around Stoke-on-Trent is known as the **Potteries**, and it is the most important district in the world for the manufacture of pottery and porcelain. The local clay is used for coarse earthenware, and fine china clay is brought in from Cornwall and Devon by sea to the Mersey estuary, and thence by canal. The city of *Stoke-on-Trent* was formed by the amalgamation of several small towns which lie in the valley of the Trent.

The industrial area of south Staffordshire is known as the **Black Country**. Here, in very early times, there was a metal industry based on local iron ore and the charcoal derived from the Forest of Arden. After the Industrial Revolution local coal began to be used for smelting iron ore, and the region became one great workshop, whose furnaces and factories gave out so much smoke as to make it worthy of the name 'Black Country.' At present, little coal mining is carried on except in Cannock Chase in the northern half of the coal-field, and the local iron, though not worked out, is not used. This decline in mining has, however, not checked the growth of the

metal industries, and the south Staffordshire region is now the greatest centre in Britain, and possibly in the world, for the manufacture of miscellaneous metal goods. On account

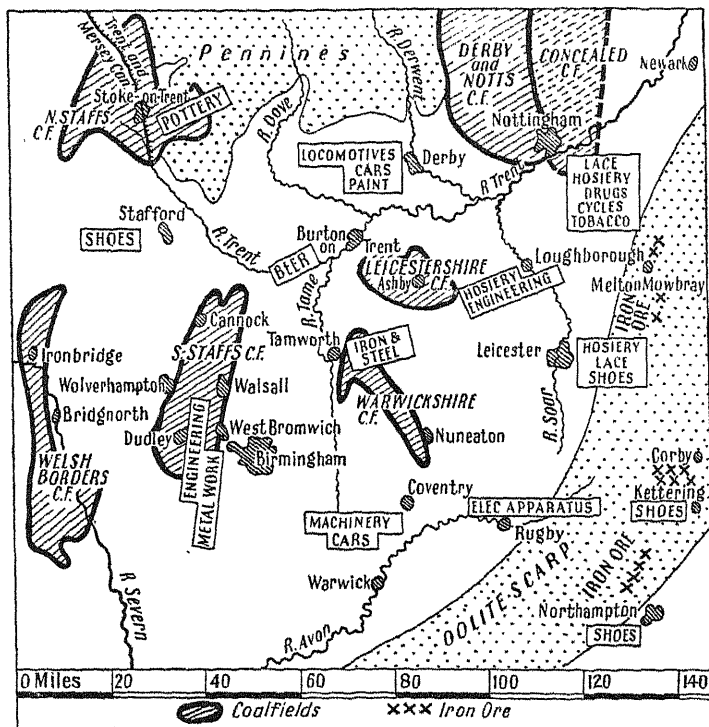


FIG. 185. THE MIDLANDS

of the distance from the sea, and the lack of local raw materials, the region has specialized in the production of goods valuable in proportion to their bulk, so that the cost of transport of raw materials and finished articles is only a small proportion of the total cost of the finished article.

Each industrial centre, besides producing miscellaneous metal goods, specializes in one or more products. Thus, *Wolverhampton*, sometimes called the capital of the Black Country, is specially noted for engineering; *West Bromwich*, for ironmongery and weigh scales; *Walsall*, for saddlery and harness and the interior fittings of motor cars.

Birmingham, though not on the coal-field, not in the Black Country, and not even in Staffordshire, is the greatest city of the region, and is, indeed, the metropolis of the Midlands. It manufactures ironware, metal goods, domestic utensils, electrical apparatus, jewellery, cycles, cars, and innumerable other articles. Other industrial centres of the Midlands are *Leicester*, which manufactures woollen hosiery and boots and shoes, both these industries being based upon the local farming products. In former times the woollen industry drew its raw materials from the sheep of the limestone escarpments to the east of the city, while the cattle of the plains around provided the hides which gave rise to the leather industry. *Northampton* and *Stafford* are both centres of cattle-rearing areas, and have also developed great boot and shoe industries. *Rugby* is famous for its school, and for its great engineering and electrical industries. *Coventry* manufactures cycles and motor cars.

Iron-mining is of great importance in parts of the limestone escarpments which form the southern and eastern boundary of the Midland Plain. In several districts the limestone has been replaced by iron ore, which is so soft and so near the surface that it can be dug out by steam navvies. The chief mining and smelting centres are *Kettering*, *Wellingborough*, and *Corby*, the last-named being a new industrial town developed in the last few years.

EASTERN ENGLAND

This is a lowland region between the Humber and the mouth of the Thames. It is crossed by two ranges: (1) the limestone escarpment which forms the Northampton Uplands and the Lincolnshire Heights and is continued north of the Humber as the North York Moors; and (2) the chalk escarpment which forms the Chilterns, the East Anglian Heights, and the Lincolnshire Wolds, the latter being continued across the Humber by the York Wolds. Between these two escarpments is a broad clay valley which is drained by the rivers Welland, Nen, and Great Ouse.

Ages ago the Wash was a great bay extending much further inland than at present. Gradually this bay was filled up with sediment brought down by the rivers and washed in by the sea, and with peat formed by the decay of plants. Thus were formed the marshes which are known as the fens. In the seventeenth and eighteenth century these fenlands were drained, and so transformed to farmlands of amazing fertility. Almost all the land in the fen district is under plough, the chief crops being wheat, roots, sown grass, and barley, which are, of course, grown in rotation. The cultivation of wheat is favoured by the rather dry, warm, sunny summer, the frequent showers of spring, the dry autumn for harvesting, the great fertility of the soil, and the almost level nature of the land, which facilitates farming operations. Barley of the type used for the making of malt is grown chiefly on the rather sandy soil. The fenland is also the chief region in the British Isles for the production of sugar beet. Certain districts, in particular that around Spalding, specialize in the cultivation of bulbs, flowers, and market-garden products.

Most of the towns in eastern England are situated on the great rivers. Two crescents of towns may be noted, viz.:

1. Ancient towns situated on the inner edge of the fens, and near the former limit of navigation. Examples of these

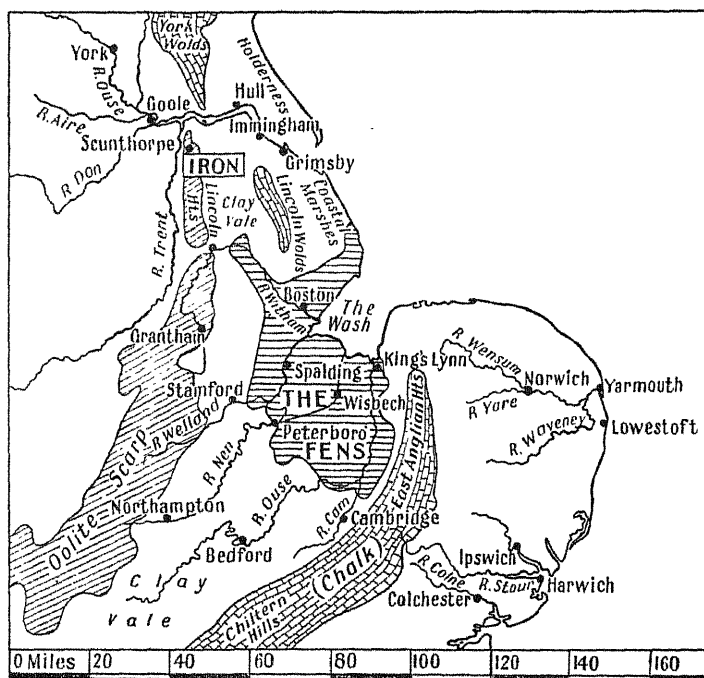


FIG. 186. EASTERN ENGLAND

are Peterborough situated on the Nen, St Ives situated on the Great Ouse, and Cambridge situated on the Cam.

2. Towns situated near the mouths of the rivers, examples of which are Boston at the mouth of the Witham, Spalding on the Welland, and King's Lynn on the Great Ouse.

All were formerly ports of great importance, and even yet Boston and King's Lynn are of minor importance as ports.

Lincolnshire is crossed by both the limestone and the chalk escarpments, the former forming the Lincoln Heights, and the latter the Lincoln Wolds. A section from west to east shows five different types of country.

1. The fertile red plain drained by the Trent.
2. The limestone Uplands.
3. The broad clay valley.
4. The chalk Wolds.
5. The coastal plain and marshes.

The limestone and chalk hills are very low and are covered with a layer of glacial drift; consequently, arable farming can be carried on right to the summit of the hills, and Lincolnshire is one of the foremost agricultural counties of the British Isles. As in the fen district, the chief crops are wheat, barley, and sugar beet, while large numbers of cattle and sheep are fed on crops grown on the arable land.

Lincoln grew up on a hill overlooking the gap by which the Witham breaks through the limestone escarpment. It has become the focus of roads and railways, and in modern times has developed an important industry in the manufacture of excavating machinery.

Scunthorpe and *Frodingham* are the most important centres for the mining of iron ore in the British Isles, and in recent years have also developed a great smelting and iron and steel industry.

Grimsby is the greatest fishing port in the British Isles, and also exports much coal from the south Yorkshire coal-field.

Immingham lies a few miles to the west of Grimsby, and was constructed by the L.N.E.R. purely as a coal exporting town.

Other towns in Lincolnshire are either agricultural market towns, such as Grantham and Louth, or coastal holiday resorts, such as Skegness and Mablethorpe.

WALES AND THE SEVERN BASIN

The population map shows that almost the whole of Wales is very thinly peopled. The reason is, of course, that most of the Principality is too mountainous for cultivation. The mountains are not, however, entirely useless; the lower hill slopes provide excellent pasture land for sheep; the fine mountain scenery attracts many tourists; water-power is generated from some of the rapid streams which flow from lakes in the Snowdon districts; and in certain valleys, reservoirs have been constructed to supply water to such cities as Liverpool (Lake Vyrnwy) and Birmingham (Lake Elan).

Most of the people of Wales live on the marginal lowlands. On the coastal plain of north Wales there are many popular holiday resorts and residential towns. These are within easy reach of the fine scenery both on the coast and in the interior, and are easily accessible from the industrial north, the Midlands, and London.

In Flint and Denbigh is a small coal-field which supports a small iron and steel industry and supplies the needs of such towns as Wrexham and Ruabon and the surrounding district. In the Snowdon district are many slate quarries such as those of Bethesda and Festiniog.

South Wales has one of the chief coal-fields of the British Isles. It produces not only the ordinary grades of industrial and domestic coal, but also the famous Welsh steam coal which is used as bunker coal by steamers, and some anthracite, this last being used chiefly for central heating and in the preparation of cement and hops.

The chief industry of south Wales is the manufacture of tin plate. The industry owes its origin to the local supplies of iron ore and coal, and to the tin ore which was formerly obtained from Cornwall. Nowadays, iron ore is not worked locally, but is imported from northern Spain and north-west Africa.

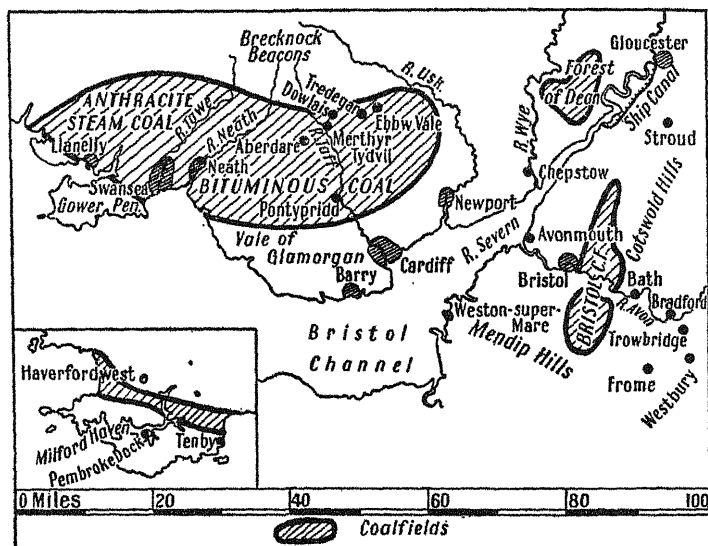


FIG. 187. SOUTH WALES AND THE BRISTOL AVON

Very little tin is now obtained from Cornwall and the supply of tin ore is now brought from Bolivia, Malaya, Nigeria, and Tasmania, but the industry continues to flourish in South Wales because its ports are the most convenient centres for the assembly of all these raw materials and for the export of the finished product. The chief centres, both for the manufacture of tin plate and for the export of coal, are *Cardiff*, *Swansea*, and *Newport*. Other industries of south

Wales are the manufacture of copper plate, zinc plate (galvanized iron), and the refining of oil.

Milford Haven is a minor naval station, which is being expanded as part of the rearmament scheme. *Fishguard* is the terminus of that line of the Great Western Railway which runs along the coastal plain of south Wales. From Fishguard rapid steamers ply to Rosslare in south-east Ireland.

The Severn is the longest river of Great Britain; it rises only 15 miles from the shores of Cardigan Bay, and follows a semi-circular course to the Bristol Channel. In its upper course it flows through narrow valleys, in which are situated Newtown and Welshpool, small towns formerly noted for the manufacture of Welsh flannel.

Below Shrewsbury the river bends southwards and flows through a narrow valley which is known as the Severn Gorge. In this district are situated two small coal-fields, Coalbrookdale and the Forest of Wyre. The lower course of the Severn is through the fertile plains of Worcestershire and Gloucestershire. The chief tributaries of the Severn are the Warwickshire Avon, which drains the fertile fruit-growing area of the vale of Evesham, and the Wye which flows through the plain of Herefordshire, an area noted for the production of beef cattle and fruit.

Near the mouth of the Severn are two small coal-fields, the Forest of Dean and the Bristol coal-field. These produce respectively 0.5 per cent and 0.4 per cent of Britain's total coal production.

In the basin of the Bristol Avon lies the West of England district which comprises such towns as Stroud, Trowbridge, Bradford-on-Avon, and Westbury. In the Middle Ages this region was the chief woollen manufacturing district of the British Isles, but after the Industrial Revolution it suffered greatly through the competition of the much better equipped

West Riding area. The industry has, however, survived by specializing in the production of goods of high quality.

Bristol is the greatest port of the region, but suffers from the fact that it is situated about eight miles up the river Avon, which is not navigable by large steamers. Avonmouth, its outport, has, however, drawn to it a considerable volume of imports from America, notably bananas, oranges, sugar, and cocoa.

Gloucester seems to have one of the best positions in Britain for an ocean port. Unfortunately the Severn between Gloucester and the sea is not navigable for large vessels, and even the construction of the Sharpness ship canal, has not enabled the city to draw to it much traffic.

SOUTHERN ENGLAND

THE SOUTH-WESTERN PENINSULA

This peninsula comprises the counties of Cornwall, Devon, and Somerset. It is a region of relatively barren moors alternating with fertile plains and valleys. Dartmoor and all the hills to the west of it are composed of granite and similar hard old rocks. Exmoor in Somersetshire is composed of hard sandstone, slates, and limestone. Among the most fertile lowlands are the plain of Somerset, the vale of Taunton, and the vale of Crediton.

The climate of the south-western peninsula is characterized by the mildness of the winters and the earliness of the spring, as well as by the abundant rainfall at all seasons. The highlands are of little use for farming, though a few sheep are reared on Dartmoor and Exmoor. Cattle-rearing is the chief occupation of the lowlands, but the region generally is too far from the great centres of population to specialize in the selling of

fresh milk, and consequently it specializes chiefly in the production of butter, cream, and cheese. Milk is, however, sent daily from Somerset to London.

The mild climate makes the region eminently suitable for the production of fruit, Devon being specially noted for cider apples. Market - gardening is also of great importance, Cornwall and the Scilly Isles being noteworthy for the production of early spring flowers, new potatoes, and vegetables.

Fishing was formerly of great importance, but in modern times the industry has suffered from the remoteness of the fishing ports from the great centres of population.

Mining has been important from the dawn of history. Cornwall was, until the middle of last century, the world's chief producer of tin. Nowadays, although considerable quantities of tin ore still remain, it is at such great depths as to make working unprofitable except in times of high prices. Copper which was formerly mined in Cornwall is not now produced.

The chief mineral now produced in the south-western peninsula is kaolin, or china clay—a fine white clay which is formed from the decay of granite. It is sent by sea from Plymouth and Falmouth to the Mersey estuary whence it is transported by canal to the Potteries.

Exeter is situated at the former head of navigation of the river Exe, at the lowest crossing-place of the river, and at the centre of the fertile plain of Devonshire. It is a focus of road and railway routes, and is an important agricultural town. *Plymouth*, situated on an excellent harbour at the mouth of the Tamar, is one of the minor commercial ports of the British Isles. Its development has been hindered by the great distance from the industrial centres, but it is of some importance as a passenger port, and the part of Plymouth known as *Devonport* is an important naval station. *Falmouth* is a

fishing port, and a minor naval station. *Torquay* is a modern residential town and holiday resort. *Bodmin*, the county town of Cornwall, is situated on a low pass through which runs the railway from *Padstow* on the north coast to *Fowey* on the south coast.

THE HAMPSHIRE BASIN

The Hampshire basin is formed by a downfold in the bed of chalk. On the northern edge of the basin the chalk crops out to make the broad plateau known as the Salisbury Plain; on the eastern edge of the basin the chalk forms the South Downs; on the western edge it forms Cranborne Chase, and on the southern side it makes the long ridge which runs through the so-called 'Isle' of Purbeck and the Isle of Wight.

Filling in this chalk basin is a comparatively thin layer of clay, surmounted by sandy deposits. Farming in the Hampshire basin is determined mainly by the type of rock. On the Salisbury Plain, for instance, sheep-rearing is the chief occupation, though arable farming is carried on wherever there is some depth of soil. On the clay which forms the narrow belt within the chalk rim of the basin, dairying is the chief occupation. The sandy beds which form the greater part of the basin are infertile; consequently the area has been left in the main uncultivated and remains in its natural state as forest and heath. In modern times, however, the mildness of the climate and the ease with which the sandy soil can be worked have led to the development of market-gardening and the cultivation of small fruit such as strawberries.

Southampton is situated at the head of the Southampton Water and on a narrow peninsula between the mouths of the rivers Test and Itchen. It has the great advantage of having

four high tides every day, and is, consequently, accessible by the largest ocean steamers at any state of the tide. Though as a commercial port it suffers somewhat through the remoteness of the great manufacturing centres, it has become the greatest passenger port of Europe, and is the headquarters of the Cunard-White Star and other famous shipping companies. *Portsmouth* is the great naval station guarding the Channel.

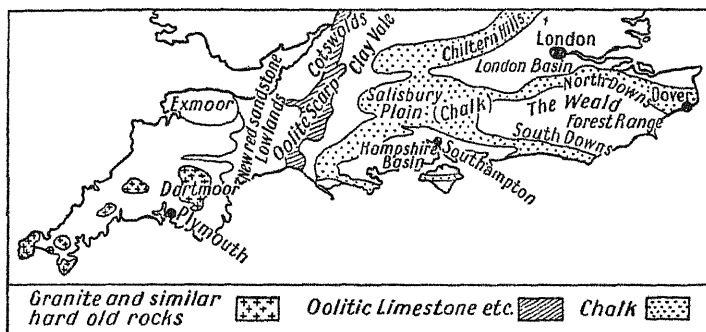


FIG. 188. SOUTH AND SOUTH-WEST ENGLAND—PHYSICAL ELEMENTS

The existence of naval dockyards has led to the rise of a great engineering industry, and the town has a population of 250,000 (cf. Southampton 176,000). *Salisbury* and *Winchester* are ancient towns commanding the routes through the chalk rim.

Bournemouth is a modern residential town and holiday centre.

SOUTH-EASTERN ENGLAND

We have seen that the Hampshire basin is formed by the downfold in the chalk. In south-eastern England, between the Thames and the south coast, the chalk has buckled up to form an arch, the top of which has been worn away revealing the edges of various underlying layers of rock (see Fig. 189).

The chalk outcrops as the North Downs and the South Downs and forms the outer frame of the region; within this frame is the horse-shoe shaped gault clay vale, with hills of Green-sand on its inner edge. Within this belt of gault and Green-sand is the broad Wealden clay vale, surrounding the central core of the Forest Range, which is composed of the Hastings sands.

As in the Hampshire basin the type of farming varies with

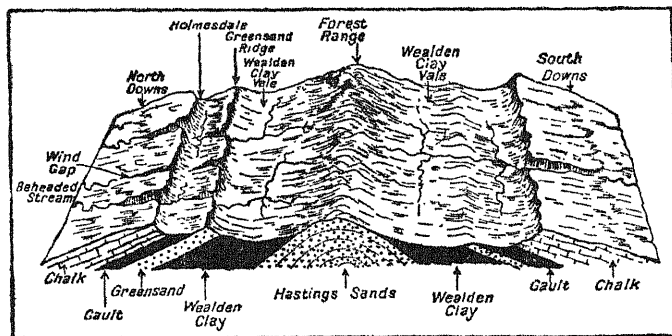


FIG. 189. STRUCTURE OF THE WEALD

the type of rock. On the chalk hills sheep-rearing is dominant, though there are large areas where there is sufficient covering of soil to make arable farming profitable. The gault clay vale and the Wealden clay vale are devoted chiefly to the production of fresh milk for the London market. Eastern Kent is covered with a thick deposit of mixed soils derived from the various types of rock. These mixed soils are exceedingly fertile and the land is devoted largely to the production of hops and fruit (plums, cherries, strawberries, apples, pears, etc.), and to market-gardening.

The towns of the south-eastern angle fall into four groups:

1. Ancient ports, such as Sandwich, Hythe, Romney, and

Hastings, which, with Dover, were formerly known as the Cinque Ports and which had in Norman times the monopoly of trade with France. Most of the harbours have, however, been silted up and the former ports are now of no use for commerce.

2. Modern packet stations, such as Dover and Folkestone, from which rapid steamers ply to the Continent.

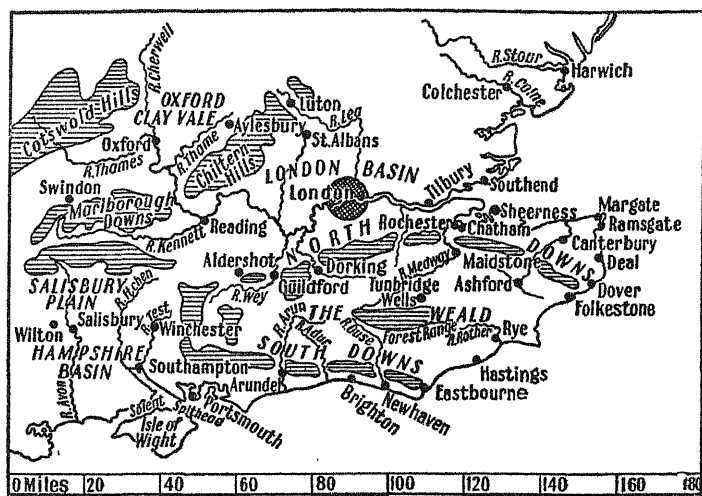


FIG. 190. SOUTH-EASTERN ENGLAND—PHYSICAL AND TOWNS

3. Coastal residential and holiday resorts, such as Margate, Ramsgate, Eastbourne, and Brighton.

4. Gap towns situated where the rivers break through the chalk ridges. Examples of these are Guildford on the Wey, Dorking on the Mole, Ashford on the Stour, and Lewes on the Sussex Ouse.

At the mouth of the Medway is a group of three towns: Chatham, noted as a naval station, Rochester, noted for the manufacture of cement, and Gillingham, an engineering centre.

THE KENT COAL-FIELD

Deep borings have revealed the existence of coal far below the chalk, and in recent years two coal-mines have been developed in this region. Up to the present the output has not been sufficient to encourage the development of any great industry, and the coal is conveyed by overhead cable to Dover, where it is loaded on to ships.

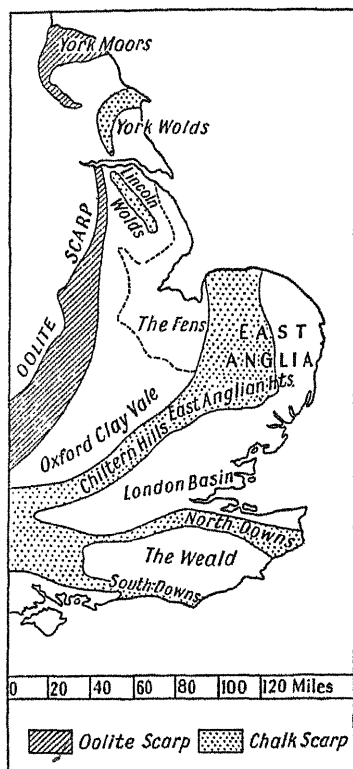
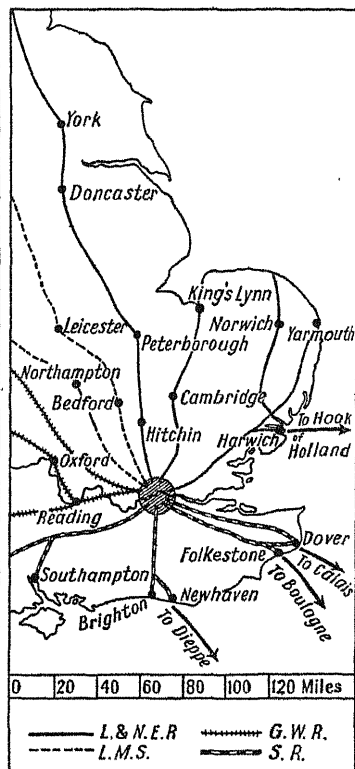
THE THAMES BASIN

The Thames basin (i.e. the area drained by the Thames and its tributaries) consists of three physical divisions:

1. The Upper Thames basin between the Cotswolds and the Chilterns.
2. The northern half of the Weald, which has already been dealt with in the previous section.
3. The London basin between the Chilterns and the North Downs.

The UPPER THAMES BASIN lies between the limestone escarpment of the Cotswolds and the chalk escarpment of the Chilterns. Between these two escarpments is a broad clay vale, which, being rather moist, is used chiefly for dairying. The chalk and limestone hills are chiefly devoted to sheep-rearing, while the land between the dry hills and the wet plain is chiefly arable land.

Oxford grew up at the point from which routes radiated across the rather moist plain, and this fact no doubt accounts for the early establishment of the university there. *Swindon*, on the Great Western line from London to the west, is a great railway engineering centre. *Witney* is noted for the manufacture of blankets, the industry owing its origin to the local wool from the Cotswolds.

FIG. 191. EASTERN ENGLAND—
PHYSICALFIG. 192. EASTERN ENGLAND—
RAILWAYS

THE LONDON BASIN

The London basin, like the Hampshire basin, is formed by a downfold in the chalk. On the northern edge of the basin the chalk outcrop forms the Chiltern Hills and on the southern edge it forms the North Downs. Under the bed of chalk is a layer of gault clay, and immediately above the chalk is a

layer of pebble beds known as the Woolwich and Reading beds. Above these beds the basin is filled in with a thick mass of London clay, above which are the Bagshot sands.

As in the Weald district, the type of rock has a great influence on the economic geography of the region. The chalk hills are used chiefly for sheep-rearing, and where there is a fair thickness of soil there is arable farming. In south Bucks there are large areas where the chalk is covered with heavy clay which has favoured the growth of beech woods. The chair-making industry of High Wycombe owes its origin to the abundance of local beech wood. The Woolwich and Reading beds, being composed of pebbles, are rather infertile, and large areas have never been cleared for farming. In modern times such areas have proved suitable sites for residential estates, while Blackheath on the outskirts of London remains a large common. The London clay was formerly extensively used for wheat-growing, but is now devoted chiefly to dairy-farming. It has also facilitated the boring of 'tubes' in London, and prevented the development of 'sky-scrappers.' The isolated outcrops of Bagshot sands have, in many cases, been used for residential building or retained as open spaces (e.g. Hampstead Garden Suburb and Hampstead Heath).

LONDON

London owes its origin and development to the following factors:

1. It is situated at the lowest convenient crossing-place of the Thames where firm ground approaches each bank. It was this fact which led to the establishment of London as a Roman fortress.
2. When the first London Bridge was built it became the head of ocean navigation.

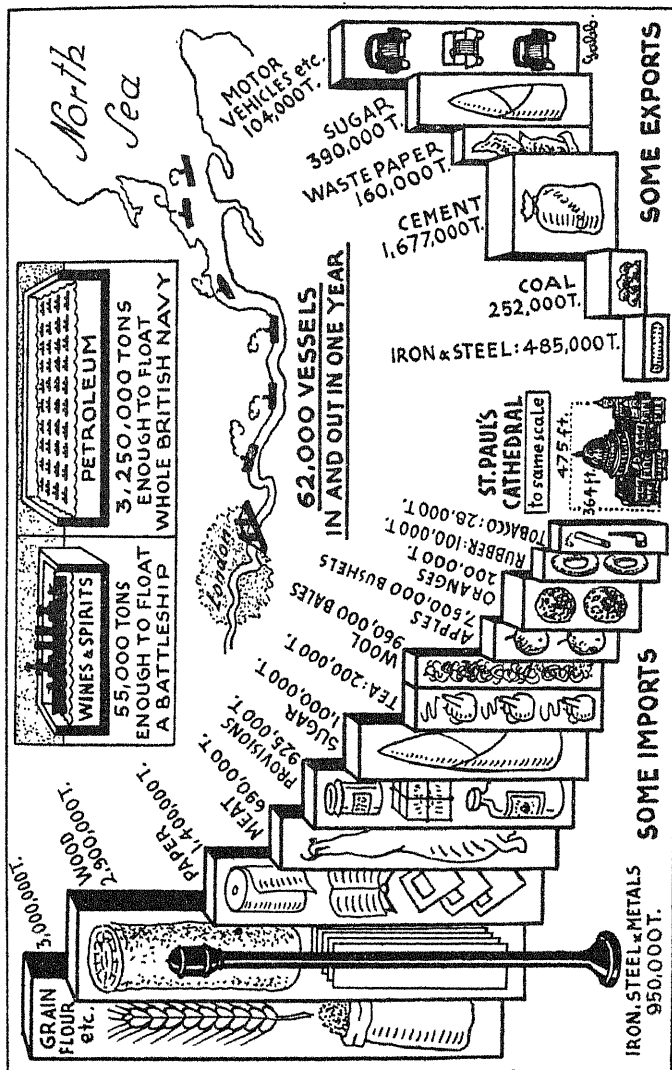


FIG. 193. THE TRADE OF LONDON

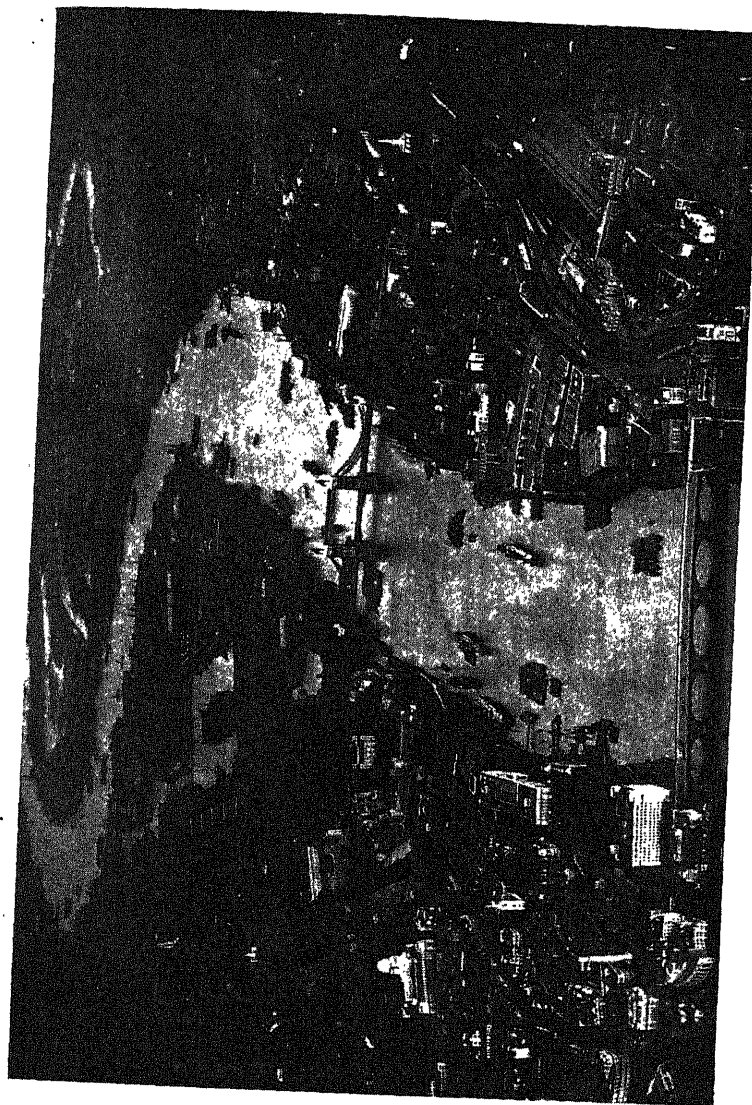
Based on a similar plan published in the 'Economist,' by permission of the Editor

3. As the capital of the country it has become the focus of roads and railways.

4. The estuary opens on to the busiest corner of the busiest sea in the world.

As the capital and the largest port of Britain, London has grown as the importance of the country has grown. It is not only the governing centre, but also the banking and business centre of the country, and one of the world's chief manufacturing centres. The city is a small area of little more than one square mile, extending around St Paul's Cathedral. The County of London has an area of nearly 116 square miles, and a population of 4,386,000. It contains, in addition to the city, twenty-eight large towns or boroughs, each with its own mayor and corporation. Greater London, which includes all the land within a radius of 15 miles of Charing Cross, has a population of 8,500,000. The port of London includes the whole of the tidal portion of the Thames from the open sea to Teddington, a distance of nearly 70 miles. Practically all the commerce on the river, however, is confined to the section below London Bridge, which is the head of navigation for sea-going ships. *Tilbury*, which is 24 miles from the sea, is the great passenger outport.

Other towns in the London basin are *Reading*, situated at the confluence of the Kennet and the Thames, noted chiefly for the manufacture of biscuits; *Slough*, which has rapidly developed in modern times as an engineering centre; and *Luton*, situated near the source of the river Lea in the Chilterns.



THE POOL OF LONDON

The 'Times'

IRELAND

Physically, Ireland consists of detached parts of Great Britain. Northern Ireland is the counterpart of the Northern Highlands of Scotland; north-eastern Ireland (the mountains of Mourne) was formerly part of a land mass which included the Isle of Man and the Lake District; south-eastern Ireland was formerly joined to Wales; and south-western Ireland is part of an ancient mountain range which used to extend through Cornwall and Devon to Brittany.

Ireland is sometimes compared to a saucer, as the mountain ranges are distributed around the edge of the island (e.g. Mourne mountains, Wicklow mountains, the mountains of Kerry, the mountains of Galway), while the interior is occupied by a great plain. The predominant rock underlying the central plain is limestone; this is of the same type as that which composes the northern Pennines, but in Ireland it is so low-lying that it is water-logged. Rain water has dissolved out great hollows in the limestone, some of which are occupied by lakes and others by great peat bogs. Of these latter the largest is the Bog of Allen, part of which has been drained to form fertile farming land. Here, too, peat is now stripped off by huge mechanical cutters, shredded and dried, then burnt to provide the energy for the generation of electricity.

Politically the island is divided into two countries: Northern Ireland and the Irish Free State or Eire. Northern Ireland consists of six counties—Down, Armagh, Fermanagh, Tyrone, Londonderry, and Antrim. Although it has a parliament of its own it sends representatives to the parliament at Westminster, and is definitely part of the United Kingdom.

Though Northern Ireland has some important manufacturing industries, the chief occupation of the people is farming.

The chief farming lands are the plains around Lough Neagh and south of Belfast. Though the farms are generally small they support large numbers of cattle, pigs, and poultry. Co-operative societies help the farmer to buy food for his cattle at the



FIG. 194. NORTHERN IRELAND

lowest possible rates, and assist him in marketing the cattle, bacon, and eggs which form the chief industry of Ireland.

The two chief crops of the arable land are potatoes and flax. The former is one of the chief foods of the people, and the latter the basis of the linen industry.

TOWNS AND INDUSTRIES

Belfast is the capital of Northern Ireland and one of the chief ports and busiest manufacturing centres in the United Kingdom. It owes its existence as a port more to the handiwork of man than to the gifts of nature, for the harbour which can now accommodate the largest ocean vessels was, until 1840, a tidal creek with a depth of only $1\frac{1}{2}$ feet at low water. The chief industries of Belfast are the manufacture of linen, ship-building, and marine engineering.

Lisburn on the river Laggan, some 12 miles above Belfast, is an important linen manufacturing centre. *Larne* is the packet station to which boats ply from Stranraer in south-west Scotland.

Portrush is a holiday centre near the famous Giants' Causeway. *Londonderry*, situated at the head of Lough Foyle, is engaged principally in the manufacture of linen and cotton goods.

EIRE (IRISH FREE STATE)

Eire may be divided into four geographical regions: the north-west, the south-west, the south-east, and the midland plain.

In the north-west, especially in County Donegal (Tirconnail) life is so hard that it is said there are only two classes—the poor and the destitute. Some relief has, however, been brought to the region by the introduction of the domestic manufacture of Donegal tweeds. *Sligo* is the chief port of the north-west, but the volume of its trade is small on account of the poverty of its hinterland. *Galway*, situated on one of the finest natural harbours of the British Isles, was an important

port from the thirteenth to the seventeenth century, but is nowadays little more than a fishing port.

South-western Ireland consists of alternating ridges and valleys trending east and west. Kerry is a thinly peopled pastoral area, the fertile valleys being given up to cattle, and the wind-swept moorlands to sheep. Killarney, with its

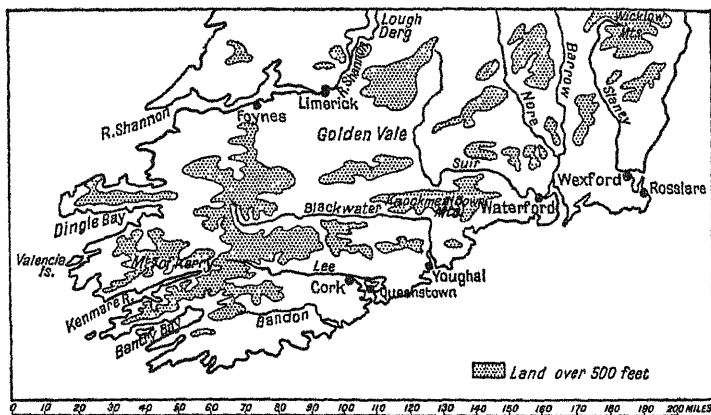


FIG. 195. SOUTHERN IRELAND

beautiful lakes and glens, is one of the most picturesque districts in Britain.

Cork, the chief city of southern Ireland, lies at the head of a deep, sheltered harbour. Its outpost *Cobb* (formerly Queens-town) is a port of call for trans-Atlantic liners.

South-eastern Ireland is not so mountainous as the south-west, and as it has also the advantage of a rather drier climate, it is a more fertile farming district. The chief towns are *Waterford* and *Wexford*, each situated on an estuary at the highest point which can be reached by sea-going vessels. *Rosslare*, the outpost of Wexford, is the packet station to which fast steamers ply from Fishguard in south Wales.

The midland plain of Ireland may be divided into three portions:

(a) The western part around the mouth of the Shannon. This is on the whole a fertile cattle-rearing region, and includes the famous Golden Vale dairying region of County Limerick. *Limerick*, at the mouth of the Shannon, is the chief centre for the distribution of butter, bacon, and eggs, produced in the surrounding district. The Shannon, which for the greater part of its course flows very slowly, passes over a series of rapids after leaving Lough Derg. These were, of course, a great hindrance to navigation, but during the present century the fall of water has been utilized for a great hydro-electric scheme which supplies power to the greater part of the Irish Free State.

(b) *The central portion* of the plain contains many loughs and bogs, but even here there is a considerable amount of cattle rearing and dairy-farming.

(c) *The eastern portion* of the plain has the advantage of being considerably drier than the rest, and there is, consequently, more arable farming in this district than in any other part of Ireland. *Dublin*, formerly the capital of the whole of Ireland, and the present capital of the Irish Free State, is situated at the lowest bridge point of the Liffey, and at the head of navigation of its estuary. Other ports are *Dundalk* and *Drogheda*.

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